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ABSTRACT

The manual includes lesson plans and suggestions for introducting handicapped children to good nutrition through enjoyable activities. Special considerations for specific types of handicaps are briefly noted (including safety considerations for children with physical disabilities). Each lesson is organized according to purpose, teacher objectives, materials needed, program preparation, and related activities to reinforce class objectives. Many activities involve the use of a puppet. Lessons touch upon such topics as food sources, food growth, planting, making a tossed salad, yogurt and fruit, and types of potatoes and how they grow. A methods section presents guides on gardening and planting techniques. (CL)

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Fun Food Experiences

for

Preschool Children with Handicaps

May 1983

Joyce Mosiman
Linda Rippetoe
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FUN FOOD EXPERIENCES
FOR PRESCHOOL CHILDREN WITH HANDICAPS

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The lesson plans were developed from the funds received from the Nutrition Education and Training Program, Bureau of Nutrition Services, Missouri Division of Health.

The children involved in our project are participants in the Children's Mercy Hospital Crippled Children's Nursery School program. We are grateful to Dorothy Morris, director of the school and her wonderful staff of teachers, therapists and aids for their time, suggestions and cooperation in our program.

This program was operated in accordance with the U.S. Department of Agriculture policy which does not permit discrimination because of race, color, sex or national origin. Any person who believes he or she has been discriminated against in any USDA - related activity should write immediately to the Secretary of Agriculture, Washington, D.C. 20250.

INTRODUCTION

Children with chronic physical impairments often fall into the category of being very poor eaters, therefore compounding their health problems. Many children with handicaps use food as a powerful tool in manipulating parents. Parents are often caught in a situation dictated by limited finances (an unwillingness to waste food) and the refusal of the handicapped child to eat a good variety of foods. Many children are allowed to eat only what they want in order to avoid waste of needed food (money) as well as unpleasant confrontations at each meal. With the many special demands on parents of handicapped children and the extra effort it takes to help the child accomplish the simplest tasks, it is understandable that this situation develops. Other problems not uncommon in handicapped children include choking and voluntary or involuntary vomiting. These problems can be brought on by certain textures of foods, sizes of food servings or combinations of the two.

We know that good nutrition is the very basis for good health. Each child has great potential and in order to reach that potential the child must have the energy to achieve his or her goal in life. Preschool children have such open and impressionable minds it is the best time to introduce fun food experiences to create an atmosphere of excitement and intrigue which may lead to changes in their acceptance of new foods. Parents are influenced by what their children demand and it is hoped that through positive presentation of good foods changes in eating will be made at home.

This program is designed to be useful in presenting foods in an interesting and fun way so that tasting is not the focal point but a by product of the lesson. The focus is on color, texture, smell, how it grows, preparing and finally tasting. The central theme is that the foods presented are good for them and will help them feel good.

Although the population for the pilot project included children with myelomeningocele disease, cerebral palsy, and hearing and speech impairments, this program is applicable to any preschool population. Fun Food Experiences is an intriguing way to help children make good early food choices.

This manual includes twelve lesson plans, suggestions for numerous reinforcing activities and some modification ideas for children with handicaps. The lessons are arranged in a manner which allows the presenter to build a concept from one presentation to the next. They do not necessarily have to be used in their exact order except for lesson #1 introducing the puppet. The puppet is the key to the success of the program. The children relate to him well and will do almost anything the puppet suggests. The poster activity which is in each lesson is also an essential part of the lessons. The children enjoy stickers and a reward for participating.

The lessons may be altered by using different vegetables or fruits which may be more pertinent to your population. The Nutrition Questionnaire in the Appendix should be helpful in determining which foods you want to use in the mystery can or plant in the garden. The time of year will be the greatest factor in determining the order of the lessons developed around gardening. You may wish to try fruits in the fall during apple and pear season as well as in the spring and summer during strawberry and peach season. The gardening will need to occur in early spring and some can continue during the summer.

The extent to which gardening is done will be determined by your facilities. You may wish to plant a large garden outside or to use containers for a garden inside with periods of outside exposure for the containers.

References for both types of gardening may be found in the Methods Section of the Appendix.

It is highly recommended that all twelve lessons be reviewed thoroughly to adapt the lessons to suit your particular situation. Preparation of materials needed for activities have been included in the class activity section but may be done before the class depending on the number of individuals involved in helping with the presentation and the abilities of the children.

It is also recommended that the presenters of the lessons have a good basic understanding of nutrition. References for this information are listed in the Methods Section of this manual including a Daily Food Guide for children in the age bracket of one year to six years old.

The dialogue for the puppet has been included as a guide for use in the lessons, but much improvision will need to be made to accommodate your particular situation and the remarks made by the children.

The classes are much more effective if the puppet is an active participant in the class activity. This necessitates at least one assistant for the presentations and more is desirable.

Evaluation forms are found in the Appendix section as a guide for the success of the lesson plan.

SPECIAL CONSIDERATIONS FOR CHILDREN WITH HANDICAPS

1. Children with a chewing problem or head positioning control should be allowed to be involved with cutting or selecting his or her taste of raw food but care should be taken to not allow them to choose too large a piece to prevent choking.

2. Each child will need help with difficult motor tasks such as peeling, scraping or cutting but the children should be allowed to do the task themselves. Many times the teachers use these classes to encourage the child to use weak limbs, etc.

3. Activities which require a lot of movement are not fitted to the handicapped. One must position the children around the activity and give easy access to all centrally used equipment.

4. Small groups work much better than large groups due to all the special attention needed for each child.

5. Emphasizing growth is probably not a good idea due to the retarded growth of most of the children (may be acceptable with children who have a speech and/or hearing handicap). It is more appropriate to talk about energy and feeling good.

6. Such activities as washing hands can be substituted with using a wash cloth. Allowing each child to clean his portion of the work surface with a clean sponge of appropriate size can be substituted for cleaning the entire table.

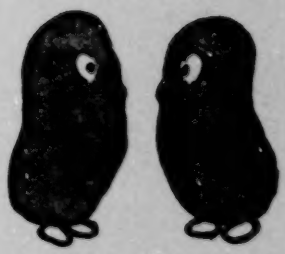
7. The children should not be rushed through an experience. Reinforcement of the topic of the lesson through repeated exposure to related experiences is highly recommended.

8. Remember they are children first and handicapped second. Don't give up or predetermine what the child can or can't do. If given the right incentive many children with handicaps will perform well.

9. In this group of children good nutrition is especially important. Many of the children require more calories to mobilize themselves. Getting started right nutritionally makes a big difference in the children's attitudes towards themselves and their therapy.

10. Parent support of the activities is important. The parent stands to gain a great deal by changing unwanted or poor food habits. Involving the parent with the child is possible through close contact through letters or personal involvement.

LESSONS



LESSON ONE

ACTIVITY - Introducing Fun Food Experiences with the puppet

PURPOSE:

1. To introduce the children to the puppet who will be leading them through fun food projects.

2. To introduce the idea of being clean when you are around food.

TEACHER OBJECTIVES:

1. Establish the puppet as a food expert and as a friend of the children.

2. Establish rules of cleanliness for the children when they handle food.

3. Establish the Honor Roll activity.

MATERIALS NEEDED:

1. Puppet (male or female). You may want to make up your own character or purchase a puppet who is a popular character. Examples: A chef, farmer, vegetable vendor, current popular cartoon character.

2. Large poster board.

3. An assortment of colored markers or crayons.

4. Colorful stickers.

5. Wash cloths - enough for each child in the group and one for the puppet.

6. Pictures of a variety of vegetables.

PROGRAM PREPARATION:

1. Practice talking and movements with the puppet.

2. Make a poster with spaces for the children's names down the left edge and mark twelve spaces for the planned activities across the top. This is the puppet's Honor Roll. Each child will be placing a sticker beside his/her name each time he/she participates in an activity with the puppet. You may wish to give stickers to those who taste (one for the poster and one to take home). At the top of the poster board in each of the twelve spaces draw a symbol for the lesson such as a small drawing of the puppet for this lesson or a wash cloth and soap. This should be an added incentive for the children to taste.

3. Draft a letter announcing your program similar to the one found in the Appendix.

4. Send a nutrition survey sheet home with each child to obtain an idea of how the children eat at home (Appendix).

5. Dampen wash cloths.

CLASS ACTIVITY:

1. Gather the children in a group around you and tell them you have a friend you would like them to meet. Tell them he/she is a special friend and knows a lot about food - especially fruits and vegetables and fun things to do with food.

2. Ask the children if they would like to meet him/her. Excuse yourself from the group and place the puppet on your hand (out of sight of the children).

3. Bring the puppet out. Wait for their reactions. Then formally introduce the group. ("Name of the Puppet") "I would like you to meet the children." (Introduce each child to the puppet by name). Allow the children to shake hands with the puppet if they want to, some may be fearful at first.

4. Puppet: "Do you know what my job is?" "I am a cook. I fix food to eat." Would you like to fix food to eat?" (wait for children's response).

   "Who fixes the food to eat at your house?" (wait for children's response). "Do you ever fix food at your house?"

5. Puppet: "One thing I always do before I handle food or eat is _____ (wash my hands). I brought some wash cloths with me so each of you can wash your hands - just for practice. (have children wash hands for practice). That's good practice and you did such a good job."

6. Have puppet show pictures and/or actual vegetables.

   Puppet: "Do you see your favorite vegetable?"

7. Puppet will point to his/her favorite vegetable and give the name of the vegetable. Discuss shape, color, texture, raw or cooked.

8. Puppet: "For next class session think of your favorite fruit and vegetable. We will be having lots of fun food times together."

9. Puppet will have his/her helper (teacher) write names of children on Honor Roll. Each child will pick out color for their name and receive a sticker for participating in class activity to place in the first column.

10. Each lesson (column) will have a picture resembling the subject of the lesson at the top of the column. This will help guide the children as to where to place their stickers.

11. Puppet: "Good-by boys and girls."

OTHER SUGGESTED CLASS ACTIVITIES TO REINFORCE CLASS OBJECTIVES:

1. Place a poster with the heading, "Vegetables I Like". Have children cut pictures from garden magazines or other magazines to paste on the poster. Have children identify other vegetables.

2. Make a vegetable scrap book.

3. Make a poster about washing hands before fixing food or eating.

4. Take a field trip to the market and observe the fresh produce section.

5. Give children pictures of vegetables that they may color. (see Appendix)

LESSON TWO

ACTIVITY - What's in the Can? (Vegetables)

PURPOSE:

1. To encourage children to use their senses to identify vegetables.
2. To give the children a chance to taste vegetables they may not have tried before.

TEACHER OBJECTIVES:

1. Make the activity of guessing what vegetable is in the can a fun game so tasting becomes fun.
2. Allow the children to describe vegetables by feel, smell and taste as well as by sight.

MATERIALS NEEDED:

1. Fresh vegetables (you may want to take specific vegetables from the children's poster). Do not use too many vegetables, as it may cause confusion.

   Examples: green pepper, tomato, carrot, cauliflower, potato, broccoli, eggplant. (BE SURE TO WASH VEGETABLES BEFORE USING -- THIS COULD BE PART OF THE CLASS PRESENTATION).

2. Small paper plates or napkins
3. Damp wash cloths
4. Knife
5. Puppets Honor Roll Stickers
6. Pictures of each of the vegetables used
7. Tray for vegetables
8. Box to hide vegetables in or a can

PROGRAM PREPARATION:

1. Obtain a cardboard can (1/2 gallon ice cream container or a large coffee can, clorox bottle could be used -- cut in half below the handle).
2. Cut a piece of fabric, 8-10 inches wide, (fabric should not be see through type). Turn top edge under to allow a hem wide enough for a ribbon, string or shoe lace to run through the hem. Sew the ends of

the fabric together to make a snug fitting band over the top of the container and secure the fabric to the can with tape (duct tape or heavy duty scotch tape). Place a colorful contact paper on the outside of the container to hide the tape.

3. String may be loosened to place food inside and drawn tight enough to allow only the child's hand inside.

CLASS ACTIVITY:

1. Have the puppet greet the children and explain the class lesson.

   "hello boys and girls, how are you?" (Wait for children's response.)

   "Have you tasted any new fruits or vegetables?" (Wait for children's response.)

   "Today we are going to learn about vegetables. What is your favorite vegetable?" (Wait for children's response.)

   "First we must wash our hands." Have puppet and assistant pass wash cloths to children. Have puppet and assistant wash hands also.

   "Now we must wash the vegetables." (Vegetables may be washed before class presentation. If this is done have puppet explain that vegetables were washed before the class started)

2. "We are going to play a game called what's in the can? What kind of vegetables are we going to put in the can? (Have puppet describe each vegetable - include children to discuss each vegetable). Description should include color, smell, feel. Tasting may also be included.

3. Place one vegetable in the container out of sight of the children. Explain that one vegetable is in the container and that they may touch the vegetable and smell but must not look inside the container. Explain that each child will tell the puppet what vegetable they think is in the container. Each child should have adequate time to feel and smell the vegetable. Children who are handicapped may lack some coordination with their hands and will need assistance.

4. After all the children have had a chance to feel and smell, the puppet will ask each child what vegetable they think is in the container (use a picture or a sample of the vegetables so the children will remember the original vegetables).

5. Ask the children who they think has the correct answer. Give the vegetable to the child with the correct answer. Wash the vegetable again and assist the child in cutting the vegetable for everyone to taste.

6. Repeat above procedures with each vegetable.

7. Have puppet ask children which vegetables they like the best.

8. Puppet should praise the children as to what good guessers and tasters the children are and have the puppet remind the children that he/she will return with another fun food experience.

9. Place stickers on honor roll.

10. Send home notes with the children about their mystery can experience. (See examples in Appendix).

OTHER SUGGESTED ACTIVITIES:

1. Allow the children to cut up left over vegetables to use as snacks.

2. Have the children color pictures of the vegetables in the mystery can.

3. Play a game where you describe one of the vegetables in the mystery can using taste, color, smell and feel. Let the children guess what vegetable you are describing.

LESSON THREE

ACTIVITY - Where Food Comes From (Tomato Plants)

PURPOSE:

1. To illustrate the cycle of plant growth (seed to fruit).
2. To introduce the concept of tasting as a way to try new foods.

TEACHER OBJECTIVES:

1. Provide children with first hand experience growing plants.
2. Stimulate the children to taste the vegetables that they will grow.

MATERIALS NEEDED:

1. Three or four tomato plants (cherry is easier to handle in a classroom situation).
2. Package of tomato seeds.
3. Styrofoam cup for each child.
4. Dirt, potting soil or artificial soil for each cup in a container easily accessible.
5. Aprons for the children to protect their clothing.
6. Large sheet of plastic to place on floor for the activity.
7. Container filled with water.
8. Set of marking pens.
9. Cherry tomatoes, ripe.

NOTE: When purchasing plants chose plants in various stages of growth. See information on Container Farming in Methods Section.

CLASS PREPARATION:

1. Purchase tomato plants in various stages of growth or plant them yourself several weeks ahead of class.
2. Put dirt or soil in container easily accessible to all the children.
3. Bring in pictures of tomato plants growing with ripened tomatoes.
4. Learn "Farmer Song."

CLASS ACTIVITY:

1. Read a story of a farmer. Show pictures of plants growing, a farmer working, etc.

2. Have puppet explain that plants grow just like children do. Explain the cycle of plant growth (seed to fruit). Show them the seeds and the final fruit of the tomato. Have them taste the tomatoes.

3. Have puppet explain how the plants need water, sunshine, food, and air to grow just like children do. Talk about how farmers plant lots of food for people to eat.

4. Ask if any of the children has a garden or knows of anyone who does. Let the children explain what a garden is and tell if they have ever helped with the garden. Tell the children they will be like farmers.

5. Place the plastic sheet on the floor (this will aid in clean up time). Place container of soil, cups, plants, seeds, tools if needed, in middle of group. Each child will receive a cup. Have child choose the color he/she wishes their name to be written in. Have each child fill their own cup with soil. Make a small hole in the soil and drop in the seed, covering to keep warm. Pass water container to each child to water seed.

6. You may wish to poke small holes in the bottom of the cup for drainage.

7. Have children place cups in the sunlight and remind them that they are growing plants like the farmers do.

8. Teach the children a song to sing to the tune of the "Farmer in the Dell."

   The farmer plants his seed
   The farmer plants his seed

   Hi Ho the Dairy-O, the farmer plants his seed

   The rain begins to fall
   The rain begins to fall

   Hi Ho the Dairy-O, the rain begins to fall

   The wind begins to blow
   The wind begins to blow

   Hi Ho the Dairy-O, the wind begins to blow

   The sun begins to shine
   The sun begins to shine

   Hi Ho the Dairy-O, the sun begins to shine

The plant begins to grow
The plant begins to grow

Hi Ho the Dairy-O, the plant begins to grow

Song from: Resources for Creative Teaching in Early Childhood Education, JoAnne Deal Hicks)
(see reference list)

NOTE: Use appropriate actions with hands and arms.

LESSON FOUR

ACTIVITY - Watch the Food Grow (Seeds and Sprouts)

PURPOSE:

1. To introduce the concept of growing and eating sprouts.

TEACHER OBJECTIVES:

1. Explain how plant foods grow with air and water.
2. Involve the children in an ongoing activity which lets them feel a sense of accomplishment when the seeds sprout.
3. Provide a new taste experience.

MATERIALS NEEDED:

1. Glass jar(s) (baby food jars may be used for each child)
2. Nylon netting or hose
3. Bean sprout seeds
4. Water container
5. Large bowl to empty water
6. Nut cups to place seeds in for each child
7. Rubber bands

CLASS PREPARATION:

1. Seeds will need to presoak overnight in the dark.

CLASS ACTIVITY:

1. Begin the session by having the puppet lead the children in singing (see Lesson #3, "Farmer in the Dell" song).
2. Bring out the jar of seeds (presoaked overnight) and divide into small cups. Have puppet talk about how the seeds look.
3. Have puppet discuss what will happen to the seeds.
4. Have puppet discuss how plants need air, sunshine, and water to grow.
5. Have puppet explain to the children that the seeds they will be using are to eat on their salad and the sprouts have good things in them for children to be healthy and feel good.

6. Each child may have his/her own jar with name on it.

7. Place the large clear glass jar in the center of the group. Have each child pour his seeds (presoaked) into the large jar. When that is completed pour in a large amount of fresh water. Place netting over the top of the jar, secure with a rubber band or string.

8. As the above activity is taking place have puppet discuss how the seeds look different than before. Have the puppet talk about how in a few days the seeds will be changing into something to taste. Talk about how only special seeds are eaten. The ones we plant in the ground we don't eat as sprouts.

9. Have the puppet ask how many children have eaten bean sprouts on salad.

10. Drain the water from the jar into the large bowl through the netting.

11. Have the puppet explain how the seeds will grow and how each day they will need to pour water on the seeds and drain them until the seeds are sprouted and big enough to eat. Emphasize that people need to drink water everyday too.

12. Send home a note explaining what the children did. If possible send a small amount of seeds home so the children can sprout them at home. You may want to use the small jars for this.

13. Place stickers on Honor Roll.

OTHER ACTIVITIES:

1. Have children bring seeds from home to sprout (radish, alfalfa). Have children try toasted pumpkin seeds.

2. Sprout seeds found in fruits (orange, grapefruit). Try sprouting an avocado seed and grow it as a plant.

3. Make a seed collage (watermelon, pumpkin, popcorn or weed seeds).

4. Be sure the children participate daily in the washing of the seeds and observe their garden.

LESSON FIVE

ACTIVITY - Planting Food to Eat (Early Spring)

PURPOSE:

1. To provide exposure to indoor and outdoor gardening.

TEACHER OBJECTIVES:

1. Expose the children to planting and caring for plants.
2. Generate a sense of responsibility for gardening chores.

MATERIALS NEEDED:

1. This activity would be most successfully done outdoors in a garden space. However, it is possible to plant the garden in cardboard flats, plastic or wooden containers (see Methods Section).
2. Suggested vegetables for the box garden: lettuce (leaf), radishes, or spinach. Suggested vegetables for outdoor garden: any of the above, tomatoes, green peppers (best if they are plants), green beans and peas.
3. Plastic bags to line boxes (if using cardboard, cut to fit bottoms of box).
4. Seeds and/or plants
5. Small garden tools to dig in outside garden
6. Watering container or hose
7. Fresh vegetables to show children what seeds will look like after growth.
8. Popsicle sticks and labels to identify contents of boxes or outside garden.
9. Stickers for Honor Roll
10. If garden is inside you may wish to lay a plastic cover on the floor.
11. Artificial or potting soil
12. Pictures of the vegetables you will be planting (familiarize yourself with the type of garden you will be planting).
13. See the Methods Section for pamphlets on planting, growing, harvesting and storing vegetables.

CLASS ACTIVITY:

1. Have the puppet introduce the activity so the children will be "farmers".

2. Pass the seeds and vegetables around to the children explaining that the seeds will become these vegetables.

3. Explain the process of the seeds being planted, becoming plants, plants producing food for the children to make a salad and eat. You may want to use pictures of vegetables growing also.

4. Explain the procedure of planting (you may wish to have dirt already in boxes or have garden tilled before hand).

5. Allow each child to plant some of each seed.

6. Allow each child to water garden.

7. Place garden outside if using boxes or near a window.

8. Have puppet remind the children of the care that the garden will need.

   a. Assigning different children to water garden, watch for weeds, allow adequate sunlight for garden.

   b. A daily check on garden.

9. Puppet and children sing "Farmer's Song"

   The farmer plants his seed
   The farmer plants his seed

   Hi Ho the Dairy-O, the farmer plants his seed

   The rain begins to fall
   The rain begins to fall

   Hi Ho the Dairy-O, the rain begins to fall

   The wind begins to blow
   The wind begins to blow

   Hi Ho the Dairy-O, the wind begins to blow

   The sun begins to shine
   The sun begins to shine

   Hi Ho the Dairy-O, the sun begins to shine

   The plant begins to grow
   The plant begins to grow

   Hi Ho the Dairy-O, the plant begins to grow

10. Place stickers on Honor Roll.

11. Send letter home with children explaining the day's activity.

OTHER ACTIVITIES:

1. Have children decide what they will make with their produce from the garden (tossed salad, vegetable salad marinated with dressing, vegetables and dip).

2. Serve vegetables as a snack.

3. Have children color pictures of vegetables they planted.

4. Make a collage of seeds or pictures of vegetables.

5. Visit a market.

6. Visit a farm.

LESSON SIX

ACTIVITY - Types of Potatoes and How They Grow

PURPOSE:

1. To introduce the children to vegetable forms that grow under the ground (tubers) using potatoes as an example.

TEACHER OBJECTIVES:

1. Provide the children with a hands on feel for the growth cycle of potatoes.

2. Give the children the opportunity to feel and taste different types of potatoes and emphasize their nutritive value.

MATERIALS NEEDED:

1. A variety of potatoes (yams or sweet potatoes, red potatoes, Idaho potatoes, etc.).

2. Potato plant (with small potatoes on the roots) and a picture of the plant growing.

3. Knife.

4. Plates, napkins, eating utensils.

5. Catsup, margarine.

6. Wash cloths (dampened)

7. Stickers for Honor Roll

   (items 3, 4 & 5 are for snack time during the week after this lesson)

CLASS ACTIVITY:

1. Have puppet lead children in the "Farmer's Song" (see Lesson #5).

2. Have the puppet explain the process of growing potatoes (eye of the potato, potatoes growing underground, seeds sprouting). Show a sprouted potato.

3. Have children assist in cleaning potatoes or you may wish to do this before the class activity.

4. Have puppet bring out all of the potatoes and pass them around. Let the children talk about how they are different, skin is tough for protection, different colors and shapes.

5. Have the puppet hold the seed potato and point to the sprouts.

   Puppet:

   "See the sprouts boys and girls. The little dents are called eyes. The sprouts come from the eyes of the potato. These eyes are not like our eyes, our eyes are to see with. The potato's eyes are to grow new potatoes."

6. Let children touch potato plant.

7. Puppet:

   "Have you ever eaten a raw potato? What kinds of potato have you eaten?".

8. Puppet:

   "We will be cooking a different kind of potato each day this week for our snack!"

9. Place stickers on Honor Roll.

10. Send home letter with children explaining the day's activities. Suggest that when parents have potatoes at mealtime they discuss the varieties and uses of potatoes. (See examples in Appendix).

11. Make different kinds of potato dishes for snacks allowing children to be involved in the preparation. Different preparations of potatoes could include baked, fried, boiled, potato salad, raw potato, mashed, escalloped, etc.

OTHER ACTIVITIES:

1. Have children color potato (see Appendix) or draw their own potato plant.

2. Start a sweet potato plant in a glass jar. Use toothpicks to keep potato out of water.

LESSON SEVEN

ACTIVITY - Making a Tossed Salad

PURPOSE:

1. To provide children with the experience of food preparation including the safe use of kitchen utensils.

TEACHER OBJECTIVES:

1. Involve the children in simple food preparation.
2. Teach the children safety rules for kitchen utensil use.
3. Provide the taste experience of combined vegetables.

MATERIALS NEEDED:

1. Vegetables for salad (cherry tomato, carrots, green pepper, lettuce).
2. Pictures of vegetables.
3. Large bowl, peelers, knives, small bowls for each child and eating utensils.
4. Utensils for tossing salad (not too large, let children toss).
5. Damp wash cloths.
6. Stickers for Honor Roll.
7. Salad Dressing.

CLASS ACTIVITY:

1. Wash vegetables for salad (have children wash hands before preparation). Vegetables may be washed before class.
2. Puppet:

   "Can you match the vegetable with the picture and tell me the name?"
   "We will make a salad today. Do you know what a salad is?"

3. Explain about the safety of using the utensils.
4. Allow each child to help with the preparation of each ingredient (grating, chopping and tearing).
5. Have the puppet instruct the children in preparation of the vegetables and place all ingredients into the large bowl.

6. Allow children to sample ingredients separately if they choose.

7. Pass the bowl to each child, allowing each child to toss the salad.

8. Allow each child to serve him/herself and use salad dressing if they choose.

9. Puppet:

   "I just love salad. My favorite ingredient is the green pepper. What is your favorite?"

10. Puppet:

    "Now we must clean up our table. It is important to leave the table clean and neat."

11. Place stickers on Honor Roll.

12. Send letter home with children explaining the day's activities. (Appendix)

OTHER ACTIVITIES:

1. Use vegetables in salad for snacks during the week.

2. Cook vegetables to allow children to experience different tastes and textures.

3. Have children color the vegetables from handouts (see Appendix).

4. Have children identify vegetables in a game or use the "What's in the Can Game."

5. Have each child describe their favorite vegetable according to touch, feel, smell, taste, color and appearance. The other children will guess what it is.

LESSON EIGHT

ACTIVITY - Please Eat these Flowers

PURPOSE:

1. To show that different parts of plants are edible.

TEACHER OBJECTIVES:

1. Illustrate that flowers are edible using broccoli and cauliflower as examples.

2. Provide an opportunity to taste cooked and raw broccoli and cauliflower in a fun atmosphere.

MATERIALS NEEDED:

1. Fresh cauliflower and broccoli

2. Pictures of cauliflower and broccoli growing

3. Hot plate or stove

4. Knives, pans to cook the vegetables in

5. Plates, knives, forks

6. Stickers for Honor Roll

7. Damp wash cloth

CLASS ACTIVITY:

1. Have puppet remind children to wash hands.

3. Clean broccoli and cauliflower (may do this before class activity).

3. Have puppet review past lesson reminding children of different foods we eat (seeds, roots).

   Puppet:

   "Today we are going to eat flowers. These flowers are from cauliflower and broccoli. Can you tell me what color they are?"

4. Pass the cauliflower and broccoli around to the children (let them feel, smell and taste).

5. Allow children to assist in cutting the vegetables. Have the children eat some of each of the vegetables raw.

6. Place vegetables in separate pans.

7. Add small amount of water and cook for approximately five minutes. Do not Overcook. During this time we have puppet review other vegetables or talk about the flowers that we should not eat. Children may like vegetables with cheese. The children could grate the cheese while vegetables are cooking.

8. Have the children taste each vegetable and ask which one they liked the best.

   Puppet:

   "Which vegetable did you like the best raw? Which vegetable did you like best cooked? Broccoli and cauliflower flowers have good things to keep us healthy."

9. Stickers for Honor Roll.

10. Send letter home with children explaining day's activity. (See Appendix).

OTHER ACTIVITIES:

1. Melt cheese on cauliflower and broccoli for a snack.

2. Pictures to color of broccoli and cauliflower. (See Appendix).

3. Add broccoli and cauliflower to tossed salad for variety.

LESSON NINE

ACTIVITY - What Fruit is in the Can?

PURPOSE:

1. To introduce the children to a variety of fruit and allow them to taste and identify texture differences.

TEACHER OBJECTIVES:

1. Allow the children to taste, feel and smell different fruits.
2. Show the children the various ways that fruits grow.
3. Provide the children with an experience in feeling the different textures of fruits.

MATERIALS NEEDED:

1. Food can (see Lesson #2)
2. Variety of fruits (strawberries, banana, pear, pineapple, orange, apple)
3. Plates, napkins
4. Knives
5. Damp wash cloth
6. Stickers for Honor Roll

CLASS ACTIVITY:

1. Puppet:

   "Remember it is important to wash our hands and the table before we work with food."

2. Wash fruits (may do this before class activity).
3. Have puppet discuss each fruit (color, texture, smell).
4. Show children pictures of fruit growing on trees and vines.
5. Pass around fruit. Have puppet ask children what the fruit is and if they like the smell.
6. Place one fruit at a time in the can (don't allow children to see fruit placed in can). Have children feel and smell the fruit. After each child has felt and smelled the fruit ask each child

what fruit they think is in the can. Have children use pictures to help identify fruit. Repeat this procedure with all of the fruits.

7. Puppet:

   "Which was your favorite fruit? My favorite was _____."

8. Place stickers on Honor Roll.

9. Send letter home with children explaining day's activities. (See Appendix).

OTHER ACTIVITIES:

1. Pineapple could be done alone. Children could see pineapple before it was cut. After cutting pineapple children could plant the top and watch it grow. Children could taste both canned and fresh pineapple, or juice.

2. Other fruits in canned, dried or juice form may be used.

3. Color the pictures of fruits in the coloring book. (See Appendix).

4. Plant strawberry plants in hanging baskets or strawberry planter.

5. Make a fruit collage (see Lesson #2).

LESSON TEN

ACTIVITY - Food Magic

PURPOSE:

1. To expose children to the same food in different forms.

TEACHER OBJECTIVES:

1. Expose the children to different tastes and forms of the same food.
2. Allow the children to make the change in the food themselves.

MATERIAL NEEDED:

1. Orange and/or grapefruit
2. Pictures of fruit growing on trees
3. Small paper cups
4. Containers for juice
5. Hand or electric juicers
6. Knives
7. Damp wash cloths
8. Stickers for Honor Roll

CLASS ACTIVITY:

1. Have puppet remind children to wash hands and table.
2. Wash fruit (this may be done before class activity).
3. Pass fruit to each child allowing them to feel and smell the fruit (one fruit at a time).

   Puppet:

   "Do you know what fruit this is?"
4. Cut each child's orange in half. Examine seeds and sections.
5. Have the puppet discuss color, texture, and smell of fruit. Have children sample fruit.
6. Peel an orange, section the orange, have children taste the orange.

7. Allow each child to squeeze the fruit to make juice (fruit should be cut in half (See #4).

8. Allow children to pour their juice into small cups and sample juice.

9. Puppet:

   "We are magicians, we turned an orange into orange juice."

10. Have puppet remind children that table must be clean and neat.

11. Stickers for Honor Roll.

12. NOTE: You may try two fruits at the same session and have children compare which they like best (orange and grapefruit). Two different tastes (sweet and sour).

LESSON ELEVEN

ACTIVITY - Where Does Milk Come From?

PURPOSE:

1. To help the child to understand that milk comes from an animal first and is then purchased at the grocery store.

TEACHER OBJECTIVES:

1. Explain to the children that food comes from plants and animals.
2. Help the child understand that the farmer raises plants and animals.
3. Help the child understand that food is important to keep us healthy.

MATERIALS NEEDED:

1. Book on animals at the farm explaining the production of milk from farm to grocery store. (See Reference Section).
2. Milk
3. Rubber glove (thin, like a surgical glove)
4. Empty milk cartons
5. Small cups
6. Large bowl
7. Damp wash cloths
8. Stickers for Honor Roll

CLASS ACTIVITY:

1. Read the children a story of a farmer and his animals.
2. Teach the children the song, "Farmer and His Cows" (tune is "Farmer in the Dell"). (See Reference Section).
3. The farmer feeds his cows
   The cows make the milk
   The farmer milks the cows
   The milk goes to the store
   We all drink the milk

   Song from: Resources for Creative Teaching in Early Childhood Education, JoAnne Deal Hicks (see Reference Section).

4. Have puppet ask the children if they drink milk.

   Puppet:

   "Do any of you drink milk? Milk is my favorite drink. It has many good things in it to help keep us healthy."

5. Puppet:

   "Have any of you seen a cow? Have you ever seen one milked? Have you ever milked a cow?"

6. Puppet:

   "We are going to pretend to milk a cow." Fill glove with warm water. Have puppet explain the similarities of the glove compared to the cow.

7. Let each child use the glove or perhaps each child could have their own glove.

8. Show the children the different sizes and shapes of containers that milk is packaged in at the grocery store.

9. Pass cups to each child and have each child taste cold milk.

   Puppet:

   "Milk is very good for us. It helps us to be healthy."

10. Sing the "Farmer and His Cows".

11. Place stickers on Honor Roll.

12. Send letters home with the children explaining the day's activities (see examples in Appendix).

OTHER ACTIVITIES:

1. Have children taste other types of milk (canned, dried, buttermilk, and skim).

2. Color pictures of farmer and cow (see Appendix).

3. Show a film on dairy products, farmers and animals.

4. Visit a dairy or zoo with milking demonstration.

5. Make something with milk (pudding, orange julius, milkshake).

6. Make a scrap book of farm animals.

Recipe for Orange Julius:

1 can concentrated orange juice
1 can (orange juice can) of milk
Ice - optional

Pour ingredients into blender. Mix until blended.
Garnish with orange slice.

LESSON TWELVE

ACTIVITY - Yogurt and Fruit

PURPOSE:

1. To expose the children to a new product which comes from milk and to offer a different taste experience by combining familiar fruits with yogurt.

TEACHER OBJECTIVES:

1. Expose the children to the fact that milk can be changed into other products.
2. Teach the children that milk and milk products are foods that make them healthy.
3. Provide the children an opportunity to experience different fruit tastes along with the taste of yogurt (without sugar or honey).

MATERIALS NEEDED:

1. Vanilla yogurt
2. Spoons, small plates or nut cups
3. Fresh fruit (strawberries, pineapple, banana, pear).
4. Plate for fruits
5. Knife for cutting fruits (this may be done ahead of class time)
6. Stickers for Honor Roll
7. Damp wash cloth

CLASS ACTIVITY:

1. Have puppet remind children that hands and tables must be washed.
2. Wash fruits and cut into appropriate bite size pieces.
3. Puppet:

   "Can you tell me what yogurt is made from?" Where does milk come from?"
4. Show the children the yogurt. Discuss the flavor and smell of yogurt.
5. Offer each child a taste of the yogurt.

6. Puppet:

   "I want to taste the yogurt with the fruit. I bet it tastes delicious."

7. Try each fruit separately and remind children what each fruit is.

8. Puppet:

   "Which fruit did you like the best with yogurt?"

9. Puppet:

   "We can eat yogurt instead of drinking milk for a change because both have the same good things to keep us healthy.

10. Puppet:

    "Do you like milk or yogurt the best?"

11. Puppet:

    "We must clean our table and leave everything neat."

12. Place stickers on Honor Roll.

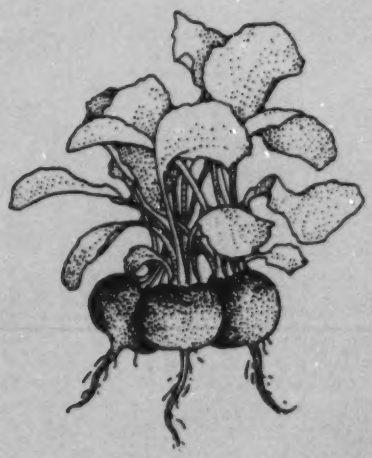
13. Send letters home to parents explaining the day's activities. (See Appendix).

OTHER ACTIVITIES:

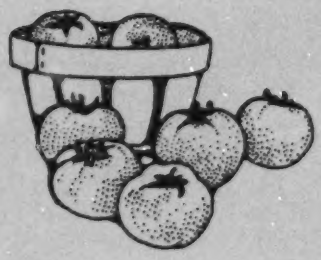
1. Make your own yogurt, cheese, or butter in class.

2. Try different fruits blended into yogurt.

3. Make a dip with plain yogurt using different vegetables.



METHODS SECTION



TIPS ON CONTAINER GARDENS

By Susan Williams
Area Horticulture Specialist
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Extension Service

CONTAINERS TO USE -

Many kinds of containers are good for growing garden plants: plastic or clay pots, an old pail, a plastic bucket, a wire basket or a wooden box. Some containers, such as bushel baskets and plastic laundry baskets are good if lined with plastic to hold the soil.

Pick a container that will be big enough for the plant when it is fully grown.

Think about the size and number of plants you want to grow. Then choose your containers accordingly. Chives and other herb plants can be grown in six-inch pots. Radishes and onions could be grown in 10-inch pots. One miniature tomato plant, such as Tiny Tim, will also do well in a 10-inch pot. For the larger vegetable plants, you can use a five gallon pail or plastic trash can.

Good drainage is important so that plant roots will not have to stand in soggy soil. If your chosen containers do not have drainage holes, then make some - at least four 1/4-inch holes. Space them evenly along the sides, near the bottom.

SOIL -

For container gardening, the use of a soil substitute, or synthetic soil, is recommended. Synthetic soil is made of vermiculite, peat moss and fertilizer and comes ready to use. There are several advantages to its use: it is free of plant disease organisms and weed seeds; it holds moisture and plant nutrients well; and it is very lightweight and portable. It is available at nurseries and garden supply centers.

SEEDS -

It is important to use good quality seed. Don't risk disappointment by using old seed that may not germinate. Some seed companies have vegetable varieties that are miniature or compact. These are especially good for container or gardening in limited space.

LIGHT -

Light is very important for plant growth. Containers need to be placed where plants will get enough light. Vegetable plants whose fruits are eaten,

(tomatoes, peppers, cucumbers) need a lot of light and should be placed where they will get at least six hours of full sun each day. Root vegetables (carrots, beets, radishes) can stand more shade than vegetable fruit plants. Leafy vegetables (lettuce, spinach, mustard greens) can stand more shade than root vegetables.

FERTILIZER -

Apply 1 level teaspoon of 5-10-5 fertilizer per square foot of soil about three weeks after the plants have reached the 2-leaf stage and again every three weeks. Mix the fertilizer into the top one-half inch of soil and water thoroughly.

WATERING -

Water is another major need of plants. You have to be especially watchful when growing in containers because the soil may dry out more rapidly than it would in a normal garden situation. On the other hand, gardening in containers lets you control moisture easily.

Water each time the soil becomes dry down to a depth of one-eight inch. During hot, dry weather you may need to water three times a week. Be careful not to slowly kill your plants by overwatering.

It is best to water plants early enough in the day to allow leaves to dry out before night. Wet leaves encourage the development of some plant diseases.

WEEDS -

Remove all weeds as they appear. They will compete with your vegetable plants for water, light and nutrients.

(Adapted from USDA Home and Garden Bulletin No. 163, "Minigardens for Vegetables.") Distributed by Cooperative Extension Service, University of Missouri and Lincoln University. Programs available to all, regardless of race, color, creed, age or sex.

GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri - Columbia Extension Division

Disease Prevention in Home Vegetable Gardens

Art Gaus, Department of Horticulture, College of Agriculture

Diseases cause untold losses to vegetables in home gardens. Most diseases can be prevented or reduced in severity by preventive measures.

Part I, of this guide, describes the more common diseases of garden vegetables and suggests best methods of prevention.

Part II, lists the most useful and practical methods of disease prevention.

PART I

Diseases of vegetables can be caused by fungi, bacteria, viruses or physiological disturbances of the plant.

Here are the most common and important diseases of vegetables in Missouri home gardens. They are listed by vegetable, alphabetically. Included are: the name of the disease; the causal organism; symptoms or description of the disease; suggested method of prevention.

Prevention is given by letter or number. *Ex. (A-1, E.)*. To decode, refer to **Disease Prevention Key**, on each page. Example: A-1 calls for seed treatment with a fungicide, E suggests crop rotation as a means of prevention.

ASPARAGUS

Rust, a fungus. Numerous rust spots on leaves; branches rapidly become bright yellow; needles fall. *Prevention:* C.

BEANS, GREEN AND WAX

Anthracnose, a fungus. Rust colored specks on pods enlarge, become sunken, darken, and in moist weather produce pink, sticky spore masses. Portions of leaves may wither and turn brown. Lesions also on stems. *Prevention:* B-1, E.

Blight, bacterial. Water-soaked spots on leaves. Areas surrounding spots may become yellowish or brown in color. *Prevention:* E.

Rust, a fungus. Minute, whitish, slightly raised spots on leaves. Later form rust colored spots. *Prevention:* B-1, E.

DISEASE PREVENTION KEY

- **A. SEED TREATMENT**
  - 1. Fungicide
  - 2. Hot Water
- **B. PLANT TREATMENT**
  - 1. Fungicide Spray
  - 2. Insecticide
- **C. RESISTANT VARIETIES**
- **D. WEED CONTROL**
- **E. CROP ROTATION**
- **F. SANITATION**
- **G. ENVIRONMENT**

Mosaic, virus. Leaves have irregular light-green areas merging with dark-green patches. Leaf puckered, especially along mid-rib. Edges of leaf curl downward. Whole plant may take on sickly yellow-green color. *Prevention:* C.

BEANS, LIMA

No serious diseases.

BEETS

No serious diseases.

BROCCOLI

Same diseases as cabbage.

CABBAGE

Black rot, bacterial. Margin of leaf turns yellow; yellow progresses toward center of leaf. Veins and veinlets become dark in color. Darkening extends down leaf and into main stem. *Prevention:* A-2, E.

Blackleg, fungus. Pale spots appear on leaves; later turn ashen-gray with tiny black specks. Spots on stems may have purplish borders. Roots decay. Plants may topple over or wilt rapidly and die. *Prevention:* A-2, E.

Yellows, fungus. Foliage takes on lifeless, yellow-green color accompanied by warping or curling of leaves and stem. Lower leaves become yellow first. Yellow tissue becomes brown and brittle. Vascular tissue in stem becomes yellow to dark brown. *Prevention:* C.

CARROT

No serious diseases.

CAULIFLOWER

Same diseases as cabbage.

CHINESE CABBAGE

Same diseases as cabbage, except no yellows.

COLLARDS

Same diseases as cabbage.

CORN, SWEET

Stewart's disease, bacterial. Leaves wilt, take on water-soaked appearance, become yellowish, then brown and dried out. Margins of leaves may roll upward. Leaves may stick together. *Prevention*: C.

Smut, fungus. Grayish smut boils containing masses of black spores. Usually found on ears. *Prevention*: None effective.

CUCUMBER

Wilt, bacterial. Leaves gradually wilt, become shrivelled and dry. May occur on one or more branches. Bacteria cause sticky ooze when cut stem is squeezed. Cucumber beetles carry bacteria in digestive tracts and transmit organism to cucumber when feeding. *Prevention*: B-2.

Anthracnose, fungus. Leaf spots start on a vein, become brown in color and roughly circular. Many spots may blight entire leaf. *Prevention*: B-1, E, F.

Angular leaf spots, bacteria. Small, water-soaked spots on leaves become tan on upper surface and gummy or shiny on lower surface. Spots assume angular shape. Centers of spots may drop out. *Prevention*: B-1 (preferably fixed copper after plants start to vine), E.

Mosaic, virus. Light yellowish mottling of leaves. Internodes become short. Plant may die prematurely. *Prevention*: B-2, C, D.

EGGPLANT

Blight & fruit rot, fungus. Brown oval spots develop on leaves. Stems have dark brown spots with gray centers. A soft, watery decay of fruit occurs. *Prevention*: A-2, B-1, C, E.

ENDIVE

No serious diseases.

KALE

Same diseases as cabbage, although not as severe or important.

KOHLRABI

No serious diseases.

LETTUCE

Aster yellows, virus. Yellowing and curling of inner leaves on which small brown spots of dried latex may occur. Transmitted by six-spotted leafhopper. *Prevention*: B-2, D, F.

MUSKMELON

Same diseases as cucumber.

MUSTARD

Same diseases as cabbage, but not too prevalent in Missouri.

OKRA

No serious diseases.

ONION

Bacterial soft rots, bacteria. Begins as onions approach maturity. Bacteria enter the neck tissue and cause a rotting of one or more scales. Onions become soft, watery, and have a foul odor. *Prevention*: Allow onions to mature before harvest.

Smut, fungus. The infection takes place in the seedling stage, usually before the plant has emerged. Black spore masses appear under outer dry skin of infected onions that reach maturity. *Prevention*: A-1.

PARSLEY

No serious diseases.

PARSNIPS

No serious diseases.

PEANUTS

No serious diseases.

PEAS, GARDEN

Root rots, various fungi. Rotting of roots and portion of stem below ground. *Prevention*: A-1, E.

Wilts, fungus. Leaves have paler than normal color and curl downward. Growth is checked, plant wilts and stem shrivels. *Prevention*: C.

Powdery mildew, fungus. Whole plant covered by white, powdery mold, with black specks appearing later in the mold growth. Vines are stunted and in severe cases may die. *Prevention*: B-1 (wettable dusting sulfur), E, F.

PEPPER

Blossom end rot, physiological. Fruit becomes water-soaked near blossom end. Tissue collapses and dries out rapidly, leaving whitish, papery area. Secondary fungi may invade, causing lesion to turn black. *Prevention*: G (particularly an adequate moisture supply).

Bacterial leaf spots, bacteria. Spot on leaf is first raised and wart-like, turning promptly to a small, dark brown lesion. Leaves turn yellow and drop. *Prevention*: Difficult. E may help. Antibiotics show some promise.

Cercospora leaf spot, fungus. Small, water-soaked spots that become gray to brown with age except for a dark margin. Centers may drop out of older spots. Leaves drop. *Prevention*: B-1, E.

Mosaic, virus. A yellowish mottling or streaking of leaves accompanied by slight distortion and dwarfing. *Prevention*: B-2, C, D.

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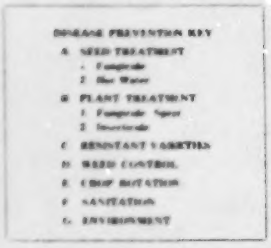

POTATO

Scab, fungus. Two types. Shallow scab consists of roughened, corky tissue. Lesions vary widely in size and shape and are slightly darker than surrounding skin tissue. Pitted scab consists of dark lesions 1 to 3 mm. deep. The tissue around the interior of the pits is corky. *Prevention:* C, E, also, plant on soil with pH below 6.0.

Early blight, fungus. Dark brown to black spots on leaflets. Spots become leather-like with concentric ridges which create the characteristic target-like pattern. *Prevention:* B-1.

Rhizoctonia, fungus. Poor stands result from killing of young sprouts. Cankers on stem cause stunting, rosetting and purpling of leaves. Tubers have superficial black sclerotia closely appressed on the skins. *Prevention:* G (shallow planting).

Note: there are many other diseases of potatoes. To insure relative freedom from them, be sure to: (1) plant only certified, northern grown seed, (2) plant only on clean soil, (3) do not apply lime or manure prior to planting in the spring.)

PUMPKIN

No serious diseases.

RADISH

Black rot, bacterial. See cabbage.

Black root, fungus. Black, lace-like areas extend into the radish, beginning in the area where the secondary roots emerge. In severe cases the whole root may appear blackened. *Prevention:* E, G (well drained soils)

RHUBARB

Ascochyta leaf spot, fungus. Numerous small, greenish-yellow areas on upper leaf surface. When spots unite, give appearance of mosaic mottling. Invaded tissue turns brown and dies, leaving spots with white centers surrounded by a red zone and a gray-green zone. Center of holes may drop out. *Prevention:* F, G (remove all leaves after first fall frost)

Crown rot, several fungi. Lesions develop at base of petiole and may cause a sudden collapse of whole leaf. The crown shows firm, brown to black tissue in stem. Secondary organisms cause rapid disintegration. *Prevention:* B-1, G (well drained soil).

SPINACH

No serious diseases.

SQUASH

No particularly troublesome diseases.

SWEET POTATO

Soil rot, fungus. Small, dark lesions appear on stem below soil line. Leaves small, stems stunted. Fleshy roots show water-soaked lesions on the surface which develop into pits of various sizes with irregular jagged margins. *Prevention:* E, F, G (plant on soil with pH below 6.0).

Soft rot, fungus. A soft, watery rot that progresses rapidly in the fleshy tissue. As skin is broken a gray mold growth covered with black spores develops. Gives a "whiskery" effect. *Prevention:* F, G (avoid chilling harvested potatoes).

Scurf, fungus. Outer cells of fleshy roots are discolored a brownish-black. Roots shrink rapidly in storage due to water loss. *Prevention:* E, G (plant on soil with pH below 6.0).

Stem rot, (wilt), fungus. Leaves become yellow between veins and are more or less distorted. Vascular bundles in stem become discolored—may extend into roots. *Prevention:* C, Use clean seed stock.

Black rot, fungus. Yellow, sickly appearance of foliage, black cankers on portion of stem below ground. On the fleshy root, circular gray-black depressed spots occur, accompanied by a shallow, dry decay. *Prevention:* E, F.

Internal cork, virus. Dark brown to blackish, hard, corky spots develop in the sweet potato. They increase in size and number the longer they are held in storage. Insects may aid in transmission. *Prevention:* C, D, (use stem cuttings).

SWISS CHARD

No serious diseases.

TOMATO

Leaf roll, physiological. Leaflets roll upwards until the margins of opposite sides touch or overlap. Leaflets become tough and leathery. May be accentuated by excessive soil moisture or heavy pruning. *Prevention:* G (plant on well-drained soils) (prune to two stems).

Blossom end rot, physiological. Water soaked spots occur on blossom end of green or ripening fruit. (May not be noticed until fruit is ripe) Spot enlarges and becomes slightly depressed. Spot may turn black and rot due to secondary organisms. *Prevention:* G (try to maintain an even soil moisture level by proper irrigation and use of mulches; maintain adequate soil calcium level).

Early blight, fungus. Somewhat circular, dark brown to black spots on leaves, usually on lower part of plant. Concentric ridges often form in the spots giving a target-like effect. Tissue surrounding spots becomes yellow. When spots become numerous leaves wither and dry up. *Prevention:* B-1.

Fusarium wilt, fungus. Yellowing and dying of lower leaves. Symptoms progress slowly or rapidly up the stem. Slight wilting of tops may occur. Vascular tissue of lower stem becomes brown. *Prevention:* C.

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Anthracnose, fungus. Small, water-soaked, slightly depressed circular spots occur on ripe fruits. *Prevention:* B-1.

Septoria leaf spot, fungus. Small, roughly circular spots with dark margins and light gray centers appear on leaves and stems. Spots may be so numerous as to "fire" the whole plant. *Prevention:* B-1.

Tobacco mosaic, virus. A mild yellowish mottle of the foliage. Leaf blades may take on a fern-like appearance. *Prevention:* F (includes washing hands with soapy water before handling plants if you use tobacco products of any kind).

Curly top, virus. (Usually affects only a few plants). Leaflets roll upward, leaf curls downward. Veins take on purple tinge. Plant is stunted and bushy. Transmitted by beet leafhopper. *Prevention:* Usually none needed.

TURNIP

Same diseases as cabbage, except no yellows.

WATERMELON

Fusarium wilt, fungus. Leaves wilt in mid-day, then shrivel permanently. Plant eventually dies. Vascular bundles become yellow or brown. *Prevention:* C.

Anthracnose, fungus. Black lesions on foliage. Dry dead tissue breaks or shatters or whole leaf dies. Fruit shows circular, sunken cankers. *Prevention:* B-1, C.

PART II

Diseases can generally be grouped into: 1. Those that can be prevented by treatment of the **seed** or **plant**, and 2. Those that **must** be prevented by using a **resistant variety** or exercising certain **cultural practices.**

PREVENTING DISEASE BY SEED OR PLANT TREATMENT

A. SEED TREATMENT

1. Use a protective fungicide such as Captan 75W; Thiram 75W; or Chloronil. These chemicals, when used according to directions on the label, help protect the seed against seed rot and damping-off. They are sold under various trade names.

2. Use hot water seed treatment. This is an exacting process, probably not adapted to the average gardener. Some seed companies offer hot water treated seed. Seed is treated at 122 F. for 20 to 25 minutes, depending upon the kind of vegetable. Exact time and temperature is most essential. After hot water treatment always use A-1 before planting the seed.

B. PLANT TREATMENT

1. Apply fungicide spray to **all exposed parts of the plant.** Materials used include: zineb, maneb, captan and fixed copper. For most vegetable diseases zineb or maneb is preferred. Zineb-captan combination sprays have been effective. Fungicide treatments for foliage diseases are usually necessary on the following vegetables: tomato, pepper, eggplant, potato, cucumber, muskmelon, watermelon and beans.

Be sure to read the label on all foliar fungicides for directions and precautions, **and especially the time interval between last application and harvest or use of the crop.** (Note: where plant treatment with a foliar fungicide is suggested, begin spraying early—within a week after germination or transplanting. A spray is more effective than a dust in preventing foliage diseases.)

2. Apply an insecticide to control insects. Insects often carry diseases that can be transmitted to vegetables. Viruses and cucumber wilt are examples. See UMC Guide 6206, "Controlling Insect Pests in Home Gardens."

PREVENTING DISEASE BY RESISTANT VARIETIES AND CULTURAL PRACTICES

C. RESISTANT VARIETIES

Certain varieties of vegetables are resistant to one or more diseases. This is "built-in" protection against disease. Take advantage of it where available! (See UMC Guide 6201 for information on disease resistant varieties.)

D. WEED CONTROL

Many weeds are infected with the same diseases as vegetables. It is important to keep weeds from growing **in the garden** and **around the garden!**

E. CROP ROTATION

Rotation of garden vegetables and rotation of garden plots are still excellent ways of keeping harmful soil fungi and bacteria at a minimum.

F. SANITATION

Clean up and burn all diseased plants and plant residue. General cleanliness in and around the garden area helps in reducing the incidence of disease.

G. ENVIRONMENT

A good, healthy, vigorously growing plant is much less susceptible to disease attack than a plant that is growing poorly. Make sure that moisture, fertilizer, plant spacing and cultivation are such to insure optimum growth of vegetables. Provide plenty of sunshine and keep the garden away from moisture and nutrient robbing tree roots.

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Leonard C. Douglas, Acting Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.

GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri-Columbia Extension Division

Controlling Insect Pests in Home Gardens—1982

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Insects are always a threat to plants in the home garden. Gardeners must frequently examine these plants for injurious insects and be prepared to begin a regular spray program as soon as they note damage.

Controlling Insects in the Soil

Insects living in the soil and injuring roots and underground portions of stems are seldom controlled by spraying the above-ground portions of plants. Injury from insects such as cutworms and wireworms may be reduced by applying an insecticide to the soil before the garden is planted.

Use a granular formulation of diazinon. To each 1,000 square feet of plowed or spaded garden surface, apply ½ pound 14 percent diazinon granules. Since diazinon tends to move downward, it should be incorporated with the top 2 inches of soil immediately after application.

Controlling Insects Above Ground

Some insect pests suck the sap from plants, others eat foliage and fruit, and others bore into the plants. Some insects attack roots of plants, while others attack above-ground parts. No single chemical will give protection against all of these insects in all situations.

An insecticide mixture containing one tablespoon 50 percent methoxychlor wettable powder and four teaspoons 25 percent malathion wettable powder in one gallon of water can be used on the vegetables listed in the adjoining table and will protect against many garden insect pests. Be sure your spray schedule includes fungicides for disease control. (See UMC Guide 6202 "Disease Prevention In Home Vegetable Gardens.")

Remember that insecticides are poisons—so read and follow label directions on use, storage and disposal.

Timing of Applications

Spray on a regular five- to seven-day interval, particularly during the early season, until the time of blooming or fruit set, to prevent a build-up of the more serious insect pests. Check plants throughout the season to see if additional sprays are needed.

Caution: DO NOT apply insecticide mixture closer to the time of harvest or use of crop than indicated in the table.

Interval Between Last Application and Harvest (Methoxychlor-Malathion Mixture)

Crop	*Days*
Potatoes	0
Cucumbers	1
Melons (all kinds)	1
Squash (summer and winter)	1
Tomatoes	1
Asparagus	3
Beans (green, lima, snap, cow peas and black-eyed peas)	3
Eggplant	3
Peppers	3
Pumpkins	3
Sweet Potato	3
Turnips (see footnote*)	3
Beets (see footnote*)	7
Cabbage	7
Carrots (see footnote*)	7
Cauliflower	7
Corn	7
Kohlrabi	7
Peas	7
Radishes	7
Broccoli	14
Brussels Sprouts	14
Collards	14
Kale	14
Lettuce (leaf & head)	14
Spinach	14

*14 days if tops are used

Controlling Asparagus Beetles

Asparagus may be damaged by two species of asparagus beetles. The reddish-orange species with 12 black spots on the wing covers and the bluish-black one with six yellowish spots on the wing covers and its blackish larvae can be controlled on the spears or leaves of the plants.

A spray containing malathion at the rate of two teaspoons, 57 percent emulsifiable concentrate, or carbaryl (Sevin) three tablespoons, 50 percent wettable powder per gallon of water, applied when the beetles first appear, will give control.

Note: There is a one-day waiting period between application and harvest with both carbaryl (Sevin) and malathion.

Controlling Spider Mites in the Garden

Spider mites (red spider or two-spotted mites) may become a

problem on certain vegetables during summer, particularly when this general purpose insecticide mixture is not used on a regular five- to seven-day schedule throughout the season.

Should spider mites become a problem, spray with one tablespoon 18.5 percent dicofol (Kelthane) wettable powder per gallon of water. Make a special effort to get complete coverage of the undersides of leaves. **DO NOT** apply dicofol to beans within seven days of harvest. **DO NOT** apply dicofol to cucumbers, eggplant, melons, peppers, pumpkins, squash or tomatoes within two days of harvest.

Controlling Grasshoppers in the Garden

Grasshoppers frequently migrate into gardens from surrounding grassy, waste or idle land areas. They should be controlled in these areas early in the season. Use either two tablespoons 25 percent malathion wettable powder or two tablespoons 50 percent or 80 percent carbaryl wettable powder per gallon of water to control grasshoppers.

Note: DO NOT apply malathion to the following vegetables within one day of harvest: asparagus, beans, cucumbers, melons, okra, squash and tomatoes.

DO NOT apply malathion to broccoli, eggplant, onions, peas, peppers, pumpkins, sweet potatoes and turnips within three days of harvest or to corn within five days of harvest.

DO NOT apply malathion to the following vegetables within seven days of harvest: Brussels sprouts, cabbage, carrots, cauliflower, celery, collards, endive, horseradish, kale, kohlrabi, lettuce, mustard, parsley, parsnips, radishes, salsify, spinach and Swiss chard.

DO NOT apply malathion to leaf lettuce within 14 days of harvest.

DO NOT apply carbaryl to the following vegetables within three days of harvest: broccoli, Brussels sprouts, cabbage, cauliflower, kohlrabi or lettuce. No time limitation is required with the use of carbaryl on beans, carrots, corn, cucumbers, eggplant, melons, okra, peppers, potatoes, pumpkins, squash and tomatoes. **NOTE:** under conditions of high humidity immediately following application of carbaryl, some foliage injury may occur.

Controlling Corn Earworms and Fungus Beetles on Sweet Corn

To control corn earworms in ears of sweet corn, use four tablespoons 50 percent or 80 percent carbaryl wettable powder per gallon of water. Begin applications when the first silks appear, and spray all exposed silks every two to three days until they turn brown. One gallon of spray will treat the ears on about 200 feet of row.

Control of corn earworm will also help prevent injury from fungus beetles. These are small, black beetles and small white grubs on silks or kernels of ears which have been damaged by earworms.

Spraying in this manner for corn earwoom control will not keep fungus beetles out of those ears which have been opened to check for maturity. In those seasons when fungus beetles are numerous, do not open the shucks until the ear is ready to be pulled.

Controlling Mexican Bean Beetles

Mexican bean beetles often become a problem on green and lima beans during summer and early fall, especially when the general purpose spray mixture is not used on a regular five- to seven-day *interval*.

Both larvae and adult beetles are very susceptible to carbaryl. Use one tablespoon 50 percent or 80 percent carbaryl wettable powder per gallon of water. One thorough spray application is usually all that is needed to control this pest. During periods of high humidity immediately following applications of carbaryl, some foliage injury may occur on beans. There is no required interval between application of carbaryl and use of beans.

Controlling Squash Vine Borers, Squash Bugs and Cucumber Beetles on Cucurbits

The squash vine borer, cucumber beetle and squash bug usually prove to be the most destructive insect pests of squash, pumpkin, cucumbers and melons in Missouri.

The squash vine borer and the squash bug are serious insect pests of pumpkins and squash while the cucumber beetles will attack these two crops as well as cucumbers, cantaloupes and watermelons. The white larvae of the vine borer bore into the stem and vines of the plants and may cause wilting and death about the time the fruits are growing.

Seedling plants are attacked readily by adults of both the striped and spotted cucumber beetle. The larvae of these insects feed on the roots of developing plants. The beetles are capable of transmitting bacteria of cucurbit wilt, which may cause wilting and death of the infected cantaloupe and cucumber plants later in the season.

Squash bugs feed in clusters on the underside of leaves and along runners after the plants vine.

Carbaryl (Sevin) at the rate of 3 tablespoons 50 percent wettable powder per gallon of water will usually give excellent control of cucumber beetles and squash bugs. The first insecticide application for cucumber beetles should be made as soon as the seedling plants start to break through the soil and should be repeated at five- to seven-day intervals until the plants start to vine. Make application for control of squash bugs later in the season when these bugs appear.

The malathion-methoxychlor mixture can be used to control the squash vine borer. Apply treatment at seven-day intervals beginning in late June and continue until the first week in August. Direct the spray at the crowns of the plants and a short distance along the larger runners.

Note: Carbaryl may cause some damage to plants if applied under extended humid conditions. Follow the intervals between application of the malathion-methoxychlor mixture and harvest on the preceding table. There is no waiting period between application and harvest with the recommended rate of carbaryl (Sevin).

Missouri insect control recommendations are annually revised and are subject to possible change during the growing season. Therefore, this guide is intended for use during the 1982 season only.

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GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri - Columbia Extension Division

Vegetable Planting Calendar

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Planning and Planting Guides

Vegetable	Approx. Planting per Person per Year: Fresh	Process	Seed for 100 ft row	Min. Row Space (in.): Hand Cultiv	Field Imple	Inches Between Plants In Row	Depth to Plant (inches)	Days from Planting to Eating Stage	Vitamin Content*: A I.U./100g	C mg
RICH IN VITAMINS A & C										
Spinach	5-10 ft	10-15 ft	1 ounce	18	42	3	½	40-50	11,790	30
Turnip greens	5-10 ft	10-15 ft	½ ounce	18	42	3	¼	35-45	10,600	60
Kale	5-10 ft	10-15 ft	½ ounce	24	42	8	¼	50-65	8,380	51
Collards	5-10 ft		½ ounce	24	42	12	¼	85-95	7,630	44
Mustard greens	5-10 ft	10-15 ft	½ ounce	18	42	3	¼	30-40	7,180	45
Cantaloupe	2-5 hills	3-5 hls	¼ ounce	48	60	60	½	80-90	3,420	33
Broccoli	5-10 plants	5-10 pl	½ ounce**	30	42	24		70-80	3,400	74
RICH IN VITAMIN A										
Carrot	5-10 ft	10-15 ft	¼ ounce	18	42	3	½	70-85	12,500	5
Swiss Chard	5-10 ft	10-15 ft	2 ounces	18	42	3	½	55-65	9,690	17
Sweet potato	10-20 pl			30	42	12		150	9,510	23
Winter squash	3-5 hls		½ ounce	48	60	60	½	100	6,190	7
RICH IN VITAMIN C										
Tomato	3-5 pl	5-10 pl	⅛ ounce**	48	60	36	—ground	75-90	1,100	23
				42	60	18	—staked	70-75		
Pepper	2-3 pl		¼ ounce**	30	42	18		70-80	740	99
Cabbage	3-5 pl	3-5 pl	¼ ounce**	24	42	12		70-80	90	31
Chinese cabbage	5-10 ft		½ ounce	24	42	6	½	75-80	260	31
Cauliflower	3-5 pl	5-10 pl	¼ ounce**	24	42	24		65-75	90	28
Kohlrabi	3-5 ft		½ ounce	24	42	4	¼	55-65	Trace	37
OTHER GREEN VEGETABLES										
Asparagus	10-15 roots	10-15 rts	1 ounce	48	48	18	½	3 years	1,040	23
Peas	10-15 ft	25-30 ft	1 pound	24	42	2	1	65-75	720	15
Green beans, bush	10-15 ft	20-30 ft	1 pound	24	42	3	1	50-60	660	14
pole	3-5 hls	3-5 hls	½ pound	30	42	36	1	60-70		
Okra	3-5 ft	5-10 ft	2 ounces	30	42	12	½	55-60	740	20
STARCHY VEGETABLES										
Potato	50-100 ft		10 pounds	30	42	12	4	100-120	20	15
Sweet corn	15-25 ft	30-50 ft	¼ pound	36	42	10	½	70-85	390	8
Lima beans, bush	10-15 ft	10-15 ft	1 pound	24	42	3	1	70-80	290	15
pole	3-5 hls	3-5 hls	½ pound	30	42	36	1	85-95		
Crowder peas	10-15 ft	15-25 ft	½ pound	24	42	3	1	75-85	370	2
Peanuts	10-25 pl		½ pound	30	42	6	1	135	0	0
OTHER VEGETABLES										
Beans, wax	10-15 ft	10-20 ft	1 pound	24	42	3	1	50-60	120	5
Beets	5-10 ft	10-20 ft	2 ounces	18	42	3	½	55-65	20	7
Cucumber	2-3 hls	3-5 hls	¼ ounce	36	48	48	½	65-70	0	8
Eggplant	2-3 pl	2-3 pl	⅛ ounce**	24	42	24		80-90	30	5
Endive	3-5 ft		½ ounce	18	42	6	¼	80-90	3,000	11
Lettuce, head	5-10 ft		¼ ounce**	18	42	6	¼	55-80	540	8
Lettuce, all other	5-10 ft		½ ounce	18	42	3	¼	35-50	1,620	18
Onions, dry	25-50 ft		½ ounce	18	42	3	¼	100-120	50	9
Onions, green	10-15 ft		sets or plts.	18	42	3		25-35	50	24
Parsnips	10-15 ft		½ ounce	24	42	3	½	150	0	12
Pumpkin	3-5 hls		1 ounce	48	60	60	½	110	3,400	—
Radish	5-10 ft		1 ounce	18	42	1	¼	25-35	30	24
Rhubarb	2-3 rts	2-3 rts		48	48	36	2	2 years	20	6
Salsify	10-15 ft		1 ounce	24	42	3	½	150	?	?
Squash, summer	2-3 hls		½ ounce	48	60	48	½	80-90	260	11
Turnip	10-15 ft		½ ounce	18	42	6	¼	50-60	Trace	18
Watermelon	3-5 hls		1 ounce	96	120	96	½	85-95	590	6

*Vegetables are *primary* sources of vitamins A and C. They also are good sources of other vitamins and minerals. In addition, they provide important bulk to our diets. The figures for vitamin content were taken from USDA Handbook 8, *Composition of Foods*. Figures indicate amounts of vitamins per 100 gram sample (about 1/5 pound) for cooked vegetables unless vegetable is normally eaten raw. The average active adult needs about 5000 International Units (I.U.) of Vitamin A and 75 milligrams (mg) of vitamin C in his daily diet.

**For direct seeding. Normally these vegetables are planted in the garden as *plants*.

What Variety Should I Plant?

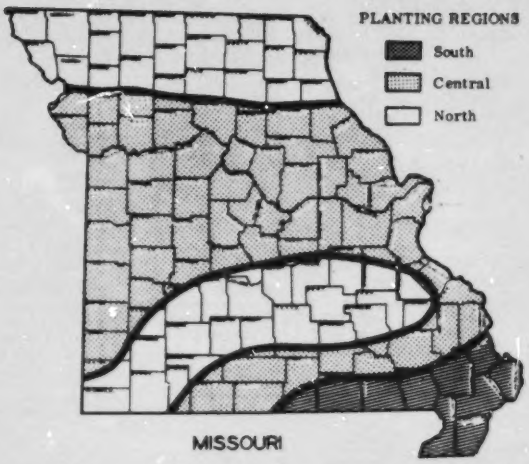
The varieties listed represent the "cream of the crop." They do not include all of the good ones. In selecting varieties we primarily consider yield, quality and disease resistance as experienced under Missouri conditions!

When Should I Plant?

This depends upon where you live. Find your county on the map to the right. Note which planting "region" you are in. Use the dates given for your "region".

If you live in the Ozark plateau area note that you use "north" planting dates. This is because of your higher elevation which subjects your area to later spring and earlier fall frosts.

Some vegetables may be planted for a fall crop. When this is possible, a second set of dates is listed under the dates for spring planting.



Planting Dates and Varieties

VEGETABLE	VARIETY	COMMENT	DATES TO PLANT "SOUTH" MISSOURI	"CENTRAL" MISSOURI	"NORTH" MISSOURI
ASPARAGUS	†Mary Washington	Use 1 year old plants or sow seed & raise your own. Do not cut for 2 years.	3/15-4/5	4/1-20	4/5-25
BEANS					
bush, green	†Blue Crop	Similar to Blue Lake, Mosaic res.	4/5-5/10	4/15-5/20	4/25-5/30
	Contender	Mosaic res., heat tolerant, high yield	8/1-20	7/25-8/10	7/25-8/5
	†Tendercrop	Mosaic res., dark green, tender pods			
	†Topcrop	Mosaic res., stringless, high yield			
	†Royalty Purple Pod	Pods turn green when cooked			
pole, green	Kentucky Wonder	Standard pole bean w/distinct flavor	4/20-5/15	5/1-20	5/10-20
	†Blue Lake	Best in eating quality, meaty			
bush, yellow	Goldcrop Wax	New excellent quality wax	4/5-5/10	4/15-5/20	4/25-5/30
	Pencil Pod Black Wax	Standard yellow or wax bean, black seeds	8/1-20	7/25-8/10	7/25-8/5
	†Kinghorn wax	Good yield quality, white seed			
bush, lima	†Henderson Bush	Most popular baby lima	4/25-5/20	5/5-25	5/10-25
	†Cangreen or Thorogreen	Green seeded varieties, good quality			
	†Fordhook 242 (large seed)	Most reliable large seeded lima			
pole, lima	King of the Garden	Large seeded lima; good quality	5/1-15	5/10-15	5/15-25
	Florida Speckled Butter	Adapted to adverse conditions			
pole, Italian	†Romano	Large, flat, distinctive strong flavor	4/25-5/20	5/5-20	5/10-25
soy, edible	See comment	Varieties not standard, use those available	4/25-5/20	5/5-20	5/10-25
dry, shelled	Michelite (White Navy)	Mosaic res., small, dry, white bean	4/25-5/15	5/5-20	5/10-25
	Red Kidney	Red, kidney-shaped (95 days)			
BEETS	†Detroit Dark Red	Standard table beet; excellent quality	3/1-25	3/15-4/15	4/1-15
	Ruby Queen	Early, good flavor, solid red	8/1-15	8/1-10	7/25-8/1
	Formanova (Cylindra)	Dark red, cylinder-like shape			
BROCCOLI (plants)	†Premium Crop	Good early variety	3/10-30	3/20-4/10	3/25-4/5
	†Green Comet Hybrid	Early, productive, excellent quality	8/1-15	7/25-8/5	7/25-30
BRUSSELS SPROUTS	†Jade Cross Hybrid	Early variety, good quality	3/10-30	3/20-4/10	3/25-4/5
			8/1-10	7/25-30	7/20-30
CABBAGE (plants)	Stonehead Hybrid (YR)* 60 days	Small, solid heads—uniform, early	3/5-4/5	3/20-4/20	4/1-20
	Golden Acre (YR) 65 days	Early, excellent quality	8/1-15	7/20-8/5	7/20-30
	Tastie Hybrid (YR) 68 days	Excellent flavor, tight heads			
	Red Acre 75 days	Good quality red cabbage			
	Hybrid Savory King 80 days	Good quality savoy (crumpled leaf)			
CARROT	†Nantes	Stump root, best adapted to Mo. soils	3/5-25	3/15-4/5	3/25-4/10
	†Chantenay Red Core	Blocky roots, adapted to heavy soils	8/1-15	7/25-30	7/20-30
	†Spartan Bonus	Med. long, vigorous, deep orange			
CAULIFLOWER (plants)	†Hybrid Snow Crown 50 days	Early, vigorous, compact plants	3/5-4/5	3/20-4/20	4/1-20
	†Hybrid Snow King 50 days	Early, uniform, good quality	8/1-15	7/20-8/5	7/20-30

†Freezing Variety
*Yellows Resistant

VEGETABLE	VARIETY	COMMENT	DATES TO PLANT "SOUTH" MISSOURI	"CENTRAL" MISSOURI	"NORTH" MISSOURI
CHINESE CABBAGE	Michihli (Chihli)	For fall planting only; frost tolerant	8/1-15	7/25-8/5	7/20-30
COLLARDS	†Georgia	Used for cooking greens	3/10-30	3/15-4/10	3/20-4/10
CORN, SWEET					
early	Early Sunglow	Yellow, 6-7 inch ears	4/15-8/15	4/25-8/1	5/1-7/20
(60-70 days)	Hybrid Golden Beauty	Yellow, res. bact. wilt, 7-8 inch ears			
early to mid-season	Hybrid Tendergold	Yellow, res. bact. wilt, 7-8 inch ears			
(70-80 days)	Butter and Sugar Sweet	Bicolored ears			
mid-season	Early Xtra Sweet	Yellow, 7-8 in. ears, very sweet			
(80-90 days)	†Golden Cross Bantam	Yellow, 7-8 inch ears			
	Illini Xtra Sweet	Yellow, 7-8 inch ears, very sweet			
late	†Iochief	Yellow, res. bact. wilt, 8-9 inch ears			
(over 90 days)	†Silver Queen	White, 8-9 inch ears, excep. qual.			
CUCUMBER					
Slicers					
regular	Marketmore 70	Dark green, res. mosaic, scab.	4/25-5/30	5/5-30	5/10-30
	Sweet Slice	Sweet, burpless, bitterfree			
gynecious	Gemini	Gynecious cucumbers have all female			
	Victory	flowers—male pollinator usually included. Tolerant of common diseases.			
Picklers					
hybrid	Liberty	Multiple diseases res., good yield			
gynecious	Saladin	All female blooms, male pollinator usually included			
Burpless	F_1 Hybrid	Mild flavor, long, many types			
Dwarf	Patio-Pik	Small vine for small gardens			
EGG PLANT (plants)	Black Beauty	Standard home garden variety	5/1-20	5/10-25	5/15-25
	Jersey King	Hybrid vigor, slim fruits			
ENDIVE	Salad King	Heat tolerant, slow bolt	3/15-4/5	3/25-4/15	4/1-15
	Green Curled Ruffic	Deeply cut leaf margins, green ribs			
	Full Heart Batavian	Also known as Escarole, buttery tex.			
KALE	†Dwarf Curled Scotch (Vates)	Finely curled, blue-green leaves	3/10-30	3/20-4/5	3/25-4/5
KOHLRABI	Grand Duke Hybrid	Use when 2-2½ in. in diameter	3/15-4/5 8/1-15	3/25-4/15 7/25-8/5	4/1-15 7/20-25
LETTUCE					
leaf	Black Seeded Simpson	Frilled yellow-green leaves, crisp	3/10-5/1	3/15-5/10	4/1-5/15
	Salad Bowl	Med. green deeply cut leaves	8/1-30	8/1-20	8/1-15
semi-head	Buttercrunch	Similar to Bibb, larger, slower to bolt	3/10-4/20 8/1-20	3/15-4/20 8/1-10	4/1-20 7/25-30
head	Great Lakes (from plants)	Standard heading variety	3/10-25	3/20-4/25	3/25-4/5
MUSKMELON (Cantaloupe)	Burpee Hybrid	Large, sweet, productive	4/20-5/15	5/1-20	5/10-20
	Supermarket Hybrid	Musky flavor, good yield			
	Saticoy Hybrid	Ex. qual., res. to wilt and mildew			
	Classic Hybrid	Excellent quality, early, wilt resistant			
MUSTARD	†Southern Giant Curled	Leading var., slow to bolt, med. green	3/10-5/1	3/15-5/1	3/25-5/1
	†Tendergreen (Spinach Mustard)	Tolerant of heat & drouth, smooth lvs	8/1-30	8/1-30	8/1-30
NEW ZEALAND SPINACH	New Zealand	Hot weather spinach substitute	3/10-5/1	3/20-4/20	4/1-20
OKRA	Clemson Spineless	Pods straight, ridged, rich green	4/20-5/10	5/1-5/25	5/10-25
	†Emerald	Round, spineless, smooth pods			
ONION	Yellow Sweet Spanish (Utah)	Mild, high yield, fair keeper	3/10-30	3/15-4/15	3/25-4/15
seed or plants (sets)	White Sweet Spanish (Utah)	Mild, white skin, fair keeper			
	Southport Yellow Globe	Fairly mild, good keeping variety			
	White Portugal (Silverskin)	Excellent for pickling, mild			
	Ebenezer	Good keeper, flat bulbs			
	Red Burgundy	Sweet and mild, deep red			
PARSLEY	Moss Curled, Paramount	Seed slow to germinate	3/20-4/10	4/1-20	4/10-20
PARSNIPS	All America	Large, tapered roots	3/20-4/10	4/1-20	4/10-20
	Hollow Crown	Seed slow to germinate			
PEANUTS	Spanish	Small, sweet, early	4/25-5/15	5/5-25	5/10-20
	Jumbo Virginia	Large, rich flavor			
PEAS					
English	†Little Marvel	Plants small but productive, early	3/1-30	3/15-4/10	3/25-4/10
	†Freezonian	Large vine, wilt res., early			
snap	Sugar Snap	Edible podded, need support	3/1-30	3/15-4/10	3/25-4/10
field	Mississippi Silver	Brown crowder, use green or dry	4/15-30	4/25-5/15	5/1-15
	Pink Eye Purple Hull	White with small purple eye			
PEPPER (plants)					
sweet	Tokyo Belle	Very early, med. size	5/1-25	5/10-30	5/15-30
	Bell Boy Hybrid	Mosaic res., blocky fruit			
	Keystone Res. Giant	Blocky shape, thick, sweet, mosaic res.			
	Yolo Wonder	Mosaic res., Calif. Wonder strain			
hot	Hungarian Yellow	Long, tapering			
	Jalapeno	Heart shape-green to red color			

†Freezing Variety

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VEGETABLE	VARIETY	COMMENT	DATES TO PLANT "SOUTH" MISSOURI	"CENTRAL" MISSOURI	"NORTH" MISSOURI
POTATO					
white skin	Irish Cobbler	Standard white var., ex. qual.	3/10-30	3/20-4/10	4/1-15
	Kennebec	Late, ex. qual., good yield			
red skin	Norland	Early, smooth, shallow eyes, res. scab			
	Red Pontiac	Late, good qual. and yield			
russet skin	Norgold Russet	Best russet, yield & qual. good			
PUMPKIN	Jack-O-Lantern	Best for Halloween, good eating qual.	5/1-15	5/15-25	5/20-30
	Early Sugar	Small fruit, sweet, orange, excellent for pies			
RADISH	Cherry Belle	Small, globular, uniform, scarlet root	3/10-5/10	3/15-5/1	3/25-5/1
	Scarlet Globe	Olive-shaped roots, bright scarlet	8/1-30	8/1-25	8/1-20
	Champion	Large, globular, mild			
	Burpee White	Tender, mild, round			
	White Icicle	Tender, mild, long			
RHUBARB (roots)	†Canada Red	Stalks dark red throughout, vigorous	3/15-30	4/1-20	4/10-25
	†Victoria	Stalks red, lighter than Canada Red			
	†Valentine	Stalks red throughout			
SPINACH	†Bloomsdale Long Standing	Thick, crumpled, dark green leaves	3/10-5/1	3/20-4/20	4/1-20
	Melody	Round, thick leaved, excel. qual.	8/1-30	8/1-20	7/20-8/10
	†America	Crumpled leaf, slow to bolt			
SQUASH					
summer	Early Prolific Straightneck	For best quality harvest all summer squash in immature stage. Many hybrids are now available.	5/1-30	5/10-30	5/15-30
	Yellow Summer Crookneck				
	White Bush Scalloped				
	Zucchini				
	Scallopini				
winter	Table Queen	Small, acorn shape, vining type			
	Table King	Small, acorn shape, bush type			
	Sweet Mama	Excellent quality, grey-green with orange flesh			
	Early Butternut hybrid	Compact vine, Butternut type			
	Gold Nugget	Bush type, small size, deep orange			
SWEET POTATO (plants)	Allgold	Early, high quality, orange flesh	5/1-6/15	5/10-6/10	5/15-6/5
	Centennial	Early, high yield, orange flesh			
	Jasper	Blocky, orange, resists soil rot			
	Jewel or Red Jewel	Good qual. copper or red skinned			
SWISS CHARD	†Lucullus	Light green, moderately crumpled lvs.	3/15-5/15	4/1-5/30	4/15-5/20
	Rhubarb Chard	Crumpled, dark green leaves, red stem			
TOMATO (plants)	Avalanche 70*	med-lg., crack resistant, productive	4/20-5/10	5/10-20	5/15-30
	Beefmaster 80	large red beefsteak type			
	Better Boy 75	med-lg., uniform, productive			
	Patio 70	small plant, 2-3 oz fruit, pot culture			
	Pink Delight 70	med-lg., pink, smooth, top quality			
	Pink Savor 75	plum shape, 1 oz fruit for salads			
	Redheart 75	large, red, meaty, top quality			
	Show-Me 72	med.-lg., cr. res., solid			
	Sunray 75	med.-lg., wilt res., orange-yellow			
	Sun-Up 60	med., compact, heavy early set			
	Supreme 70	med-lg., productive			
	Surprise 65	med-lg., cr. res., productive			
TURNIP	Just Right Hybrid	Flattened globe shape, all white	3/10-5/1	3/20-5/1	3/25-5/1
	Purple Top White Globe	Standard variety for roots and tops	8/1-30	7/20-8/15	7/20-8/5
	Shogoin	Principally used for greens			
WATERMELON	Dixielee	Very sweet, deep red flesh			
	Crimson Sweet	High quality, wilt & anthrac. res.			
	Petite Sweet	Sweet, 10 lb, less vine			
	Seedless (TRI-X 317 or 313)	Requires special care and culture			

†Freezing Variety
*days from transplanting to harvest

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture, Leonard C. Douglas, Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211 ■ An equal opportunity institution.

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GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri - Columbia Extension Division

Vegetable Harvest and Storage

Arthur E. Gaus, Henry DiCarlo and Rudy Zuroweste
Department of Horticulture, College of Agriculture

GOOD EATING!

That's the ultimate reward of growing vegetables—but good eating depends on good quality. And good quality depends on timely harvest and proper storage. That's what this *Grounds for Gardening* guide is all about.

Tips are given on:

- When to harvest
- How to harvest
- Special harvest preparations
- Special storage requirements
- Length of storage
- Kinds of storage

A few terms used in the harvest-storage chart should be defined. Mention is made of types of freezes in relation to harvest. Consider the following:

- Light Freeze—28-32°F
- Moderate Freeze—24-28°F
- Severe Freeze—below 24°F

You should also recognize that "ideal" storage conditions for many vegetables are not attainable around the average home or farm. So, simply use the best storage available and recognize its limitations.

The refrigerator is suggested as one storage place. If there are two refrigerators available, one can be kept at a cold temperature (32-40°) and the other at a cool temperature (45-50°). If there is only one refrigerator with the control set for normal operation, the temperature in the center storage section is usually between 38 and 42°F. The temperature below the freezing unit is lower—often between 30 and 35°F. The bottom of the cabinet is somewhat warmer than the center. Check the setting of the temperature control by placing a thermometer in different places in the refrigerator. Remember also that frequent opening of the refrigerator door raises the temperature inside.

Basements are suggested as possible storage places. Temperatures in most heated (air conditioned) basements will usually be 65°F plus in summer and 60°F minus in winter. Separate sections can be partitioned to vary the temperature and humidity. You can use outdoor air, dirt floors, wetted sacks, etc. to vary the temperature and humidity needs. Unheated basements, if well ventilated, can provide good storage conditions for some vegetables.

If you have a large quantity of one or more vegetables and desire to build a special storage structure or use outdoor pits, obtain a copy of "Storing Vegetables and Fruits," USDA Home and Garden Bulletin No. 119. Copies should be available from your local Extension Center, or they can tell you where to get a copy.

VEGETABLE HARVEST AND STORAGE

COLD, MOIST (32-40°F, 90-95% relative humidity)

Root Crops:

Beets	Begin harvest when beet is one inch in diameter. Tender tops make excellent greens. Main harvest is when beets are 2-3 inches. Harvest spring-planted beets before hot weather (July). Harvest fall beets before the first moderate freeze. For storage, wash roots, trim tops to one-half inch, place in perforated plastic bags and store in refrigerator, cold moist cellar or pit. Storage life is 2-4 months.
Carrots	Harvest spring carrots before hot weather (July). Fall-planted carrots should be harvested before the first moderate freeze. For storage, wash roots, trim tops to one-half inch, place in perforated plastic bags and store in refrigerater, cold moist cellar or pit. Storage life is 2-4 months.
Horseradish	Harvest after several severe freezes. Store in the ground all winter; mulch with straw or leaves and dig when needed.
Parsnips	Harvest in late fall after several moderate freezes. Exposure to cold develops the sweet flavor. For storage requirements, see carrots.

COLD, MOIST (32-40°F, 90-95% relative humidity) (Continued)

Root Crops (Continued)

Potato, Irish	Harvest in July *when the tops have yellowed or died. Do not leave in ground exposed to high soil* temperatures from sun. Wash potatoes and remove the diseased or damaged ones. Cure for about a week in a shaded, well-ventilated place (open barn, shed, garage). Avoid exposing tubers to light. Store in as cool a place as possible at this time of year. You are not likely to find ideal storage conditions at this time of year other than commercial cold storage. Cool basements are probably the best storage available. Keep humidity high and provide good ventilation. Storage time is 2-4 months.
Radish	Harvest when ½ to 1 inch in diameter. Wash roots, trim both tap root and tops and store in plastic bags in refrigerator for up to one month. Winter or black radishes are stored the same as carrots.
Salsify	See parsnips for harvest and storage.
Turnip	Turnips can be harvested from the time they are one inch in diameter. They are best as a fall crop and can withstand several light freezes. Store the same as carrots.

Cole Crops (Cabbage group):

Broccoli	Harvest terminal head while florets are still tight and of good green color. Smaller side heads will develop. Store in perforated plastic bags for up to one week in the refrigerator. Freeze any surplus.
Brussels sprouts	Harvest the sprouts (small heads) when they are firm; begin from the bottom of the plant. Sprouts can stand several moderate freezes. Harvest all sprouts prior to the first severe freeze and store in the refrigerator in perforated bags for up to three weeks. Freeze any surplus.
Cabbage	Harvest when heads are solid. Store cabbage in refrigerator, cold cellar or outdoor pit in plastic bags for up to two months.
Cauliflower	Tie outer leaves above the head when curds are about 1-2 inches in diameter (except purple types). Heads will be ready for harvest in about two weeks. Cauliflower may be stored in perforated plastic bags in the refrigerator for up to two weeks. Freeze any surplus.
Chinese cabbage	Grow only in the fall. Harvest head after the first moderate frost in the fall and store in perforated plastic bags in the refrigerator, cold cellar or outdoor pit. Chinese cabbage will keep for up to two months.
Kohlrabi	Harvest when the swollen stems are 2-3 inches in diameter. Stems become woody if left too long before harvest or if grown under poor conditions. Cut off root and leaf stems and store in plastic bags as indicated for carrots. Storage life is 2-4 weeks.

Greens:

Chard (Swiss)	This is a summer green that is harvested continuously. Merely break off the outer leaves. Swiss chard is a beet developed for its top. A spring planting will provide greens from early summer to the first moderate freeze. Store up to two weeks in refrigerator.
Collards, Kale, Mustard, Spinach	Harvest the leaves and leaf stems of greens when they reach suitable size. Either harvest the whole plant or the outer, larger leaves. Greens do not store well, but may be kept in plastic bags in the refrigerator for up to two weeks. Freeze any surplus.

Salads:

Endive (Escarole)	Harvest whole plant. Wash thoroughly to remove soil and sand. Gather leaves together and tie with rubber band. Store in plastic bags in refrigerator for up to three weeks.
Lettuce	Head, semi-head and leaf lettuce can be stored for up to two weeks in perforated plastic bags in the refrigerator.
Parsley	Parsley will over-winter if planted in a protected place such as a cold frame. If planted in the open, it can be carefully lifted with a ball of soil just before the soil freezes, potted and taken into the house in a cool, sunny room and harvested for several weeks. Parsley will keep in plastic bags in the refrigerator for about one week.

COLD, MOIST (32-40°F, 90-95% relative humidity) (continued)

Legumes:

Lima Beans	Harvest when pods have filled. For tender limas, harvest when a bit immature; for "meaty" limas, harvest when mature. Shelled limas can be stored in perforated plastic bags in the refrigerator for about a week. Surplus limas can be canned or frozen.
Garden peas	Harvest when pods have filled. For tender peas, harvest when a bit immature; for "meaty" peas, harvest when mature. Unshelled peas can be kept in a perforated plastic bag in the refrigerator for about a week. Freeze or can surplus.
Southern peas (Crowder, Purple Hull, etc.)	For fresh use, freezing or canning, harvest when seeds are large and plump but moist. Either shelled or unshelled peas may be stored in the refrigerator for several days.

Vine crops:

Cantaloupe (Muskmelon)	Harvest when the stem slips easily from the fruit. Lift the melon; if ripe it should separate easily. Store ripe melons in the refrigerator in a plastic bag for up to 10 days. Try a few boxes of frozen melon balls.
Squash, summer	Harvest when fruit is young and tender. Skin should be easily penetrated with the thumbnail. Store for up to a week in a perforated plastic bag in the refrigerator.

Other Vegetables:

Asparagus	Harvest by snapping 10-12 inch spears off at ground level. Store in plastic bag in refrigerator for up to one week. Freeze or can any surplus.
Onions, green	Harvest green onions when they attain sufficient size. Cut off roots; remove top, leaving an inch of green. Place in plastic bag and store in refrigerator for up to two weeks.
Rhubarb	Harvest leaf stalks when ½ to 1 inch in diameter. DO NOT USE LEAVES. Rhubarb can be stored in perforated plastic bags for up to three weeks in the refrigerator. Surplus rhubarb can be frozen.
Sweet corn	Harvest sweet corn when kernels are plump and tender. Silks will be dry and kernels filled. Check a few ears for maturity: Open top of ear and press a few kernels with thumbnail. If milky juice exudes, it is ready for harvest. Sweet corn has a very short storage life. Harvest at peak of quality, husk to conserve space, and store in plastic bags for no more than two days in the refrigerator. Freeze or can surplus corn.

COOL, MOIST (45-50°F, 80-90% relative humidity)

Cucumber	Harvest cucumbers before seeds become half-size. This will vary with variety. Most varieties will be 1½-2½ inches in diameter and 5-8 inches long. Pickling cucumbers will be a bit more blocky and not as long as slicers. Store slicing cucumbers in the warmest part of the refrigerator. Place in plastic bag. Storage life is about one week. Pickling cucumbers should be cooled quickly in ice water and can be kept up to two days in a plastic bag in the refrigerator.
Eggplant	Harvest when fruits are nearly full-grown, but color is still bright. Eggplants are not adapted to long storage. Keep in warm part of refrigerator for about a week.
Beans, green	Bean pods will be most tender when the small seed inside is one-fourth normal size. The pods become more fibrous as the beans mature. Store green beans up to one week in perforated plastic bags in the warm part of the refrigerator. Can or freeze surplus.
Okra	Harvest okra pods when they are 2-3 inches long. Over-mature pods are woody. Store in plastic bags in the warm part of the refrigerator for about one week. Freeze surplus.
Peppers, sweet	Harvest when fruits are firm and full size. If red fruits are desired, leave on plant until red color develops. Sweet peppers can be stored for 2-3 weeks in the warm part of the refrigerator in plastic bags.

COOL, MOIST (45-50°F, 80-90% relative humidity) (Continued)

Tomato	Ripe tomatoes will keep for a week in the refrigerator at 45-50°F. Green, mature tomatoes, harvested before frost, should be kept at a temperature between 55 and 70°F. For faster ripening, raise temperature to 65-70°F. Mature green tomatoes should approach normal size and have a whitish green skin color. Keep mature green tomatoes from 3-5 weeks by wrapping each tomato in newspaper and inspecting for ripeness each week.
Watermelon	Harvest when underside of fruit turns from whitish to yellowish. The tendril at the juncture of the fruit stem and the vine usually dies when the fruit is mature. Thumping an immature melon gives a ringing metallic sound, while a mature melon gives a dull thud. Watermelons will store at room temperature for about a week and at a temperature of 45-50°F for two or three weeks.

COOL, DRY (45-55°F, 50-60% relative humidity)

Onions, dry	Harvest onions when the tops have fallen over and the necks have shriveled. Remove tops, place in shallow boxes or mesh bags and cure in open garage or barn for 3-4 weeks. Store in mesh bags in as cool a place as can be found in mid-summer. During humid (muggy) weather keep ventilated.
Peppers, hot	Pull plants late in the season and hang to dry in sun or a warm place. Store in a dry cool place (usually a basement).

WARM, DRY (55-60°F, 60-70% relative humidity)

Pumpkins, Squash, winter	Harvest pumpkins and winter squash when the skin is hard and the colors darken. Both should be harvested before frost. Remove the fruit from the vine with a portion of the stem attached. Store on shelves in a single layer so air can circulate around them.

WARM, MOIST (55-60°F, 80-85% relative humidity)

Sweet potatoes	Harvest in fall before frosts and freezing temperature. Handle carefully in the digging process. Cure for one week at a temperature of 80-85°F. Ideal storage is at 55°F and 85 per cent relative humidity (This might be accomplished in a basement with ventilated boxes covered with periodically moistened burlap sacks.)

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UMC Science and Technology GUIDE

Organic Gardening Techniques

Organic Matter, Fertilization, and Pest Control

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The success or failure of the organic approach depends on how gardeners use and prepare organic matter. Organic matter improves soil tilth and prevents soil compaction and crusting. It increases the water-holding ability of the soil and provides a more favorable soil environment for earthworms and beneficial microorganisms. It slows erosion, and, in later stages of decay, organic matter releases nitrogen and other nutrients to growing crops. Carbon dioxide from decaying organic matter brings minerals of the soil into solution, making them available to growing plants. Many soils of the world have been ruined, mainly because they have been depleted of organic matter from prolonged cultivation without proper soil management.

Sources of Organic Matter

Animal manures. Where available, animal manures are excellent sources of organic matter and nutrients for the soil. It is best to apply manures after they have been composted and partially broken down. Fresh manure may be applied directly to the soil, but this should be done in fall and plowed down so that there is adequate time for sufficient breakdown and ammonia release before crops are planted.

Those who do not have access to fresh or composted animal manures may find packaged dried manures for sale in nurseries and garden stores. Because fresh and composted manure contains high amounts of water, an equal weight contains less nutrients than dried manure. Also, fertility of manures from different sources varies widely. Table 1 gives some average figures.

To interpret the table, note that each 100 pounds of fresh cattle manure contains about 1/2 pound of available nitrogen, while 100 pounds of dried cattle manure contains about 2 pounds. Compare these amounts to a common commercial fertilizer such as 10-10-10, which contains 10 pounds of nitrogen per 100 pounds. By observing the nutrient content of the major constituents of a fertilizer, a guide to the appropriate rate of application can be developed (See Table 2.)

Table 1. Major Constituents of Animal Manures (%)

	Nitrogen (N)	*Phosphorus* (P_2O_5)	*Potassium* (K_2O)	*Calcium* (Ca)	*Magnesium* (Mg)	*Organic Matter*	*Water Content*
Undried							
Cattle	.5	.3	.5	.3	.1	16.7	81.3
Sheep	.9	.5	.8	.2	.3	30.7	64.8
Poultry	.9	.5	.8	.4	.2	30.7	64.8
Horse	.5	.3	.6	.3	.1	27.0	68.8
Swine	.6	.5	.4	.2	.03	15.5	77.6
Dried							
Cattle	2.0	1.5	2.2	2.9	.7	69.9	7.9
Sheep	1.9	1.4	2.9	3.3	.8	53.9	11.4
Poultry	4.5	2.7	1.4	2.9	.6	58.6	9.2

Table 2. Manure Application Rates.

To apply from ¼ to ½ pound actual nitrogen, add one of the following:

- 50 to 100 lbs. undried cattle manure,
- 20 to 50 lbs. undried poultry manure,
- 12 to 25 lbs. dried cattle manure,
- 5 to 10 lbs. dried poultry manure or
- 2.5 to 5 lbs. 10-10-10 fertilizer.

Fresh manure should not be used directly among plants or mixed into soil immediately before seeds or plants are placed in the garden. Fresh manure produces ammonia as it decomposes. Ammonia in direct contact with plant roots can cause damage and must be avoided. Another disadvantage of uncomposted manure is the introduction of weed seeds into the garden. More detail on manures is given in the UMC Guide Sheet 9331, "Animal Manure for Crop Production."

Compost. Where manures are not readily available, you can make compost from lawn clippings, leaves and other plant materials (See Figure 1). Compost is not only convenient, but also inexpensive. Nutrient content of compost is relatively low, but its main benefit is the organic matter it adds to improve soil tilth. For detailed information on compost making, see Grounds for Gardening Guide 6956, "Making and Using Compost."

Green manure and fall cover crops. Where the garden area to be improved is large, or where other forms of organic matter are not readily available, green manuring is often the most economical means for soil improvement. Green manuring means growing a cover crop in your garden and plowing it under, thus adding organic matter to the soil. The greatest response from green manuring comes from not using the garden for one season, while growing a grass or other green manure crop and plowing it under in early fall.

Another method is to seed a green manure crop in the fall and turn it under with a plow or large tiller in early spring. With this method, you can continue to use your garden normally, while gradually building up the soil.

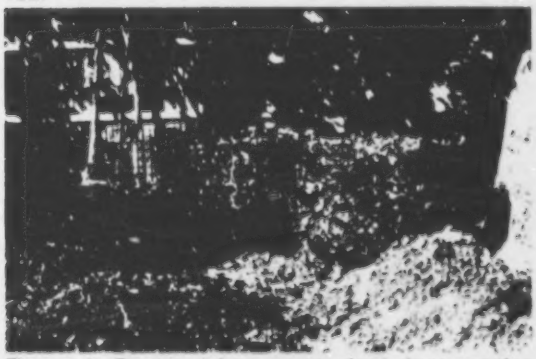

Figure 1. Compost is a convenient, inexpensive source of organic matter.

Generally, you should seed a cover crop in September, not later than October 1. The cover crop protects the garden from erosion during the winter. Plow under the cover crop when it is 6 to 8 inches tall. If it grows taller, mow it down before plowing.

Annual ryegrass is one of the most satisfactory plants for green manuring or covering. Seed it at 1 to 2 pounds per 1,000 square feet of garden space. Seed rye or wheat at 3 to 4 pounds per 1,000 square feet. Thorough incorporation into the soil is important in early spring to prevent regrowth and weediness from these grasses. Wait at least two weeks before planting.

Sawdust. In some areas where sawdust is readily available, it provides an excellent source of organic matter for the soil. You can use sawdust as compost, as mulch, or for direct incorporation into the soil. A normal addition of sawdust would be about 3 to 4 bushels per 100 square feet of garden area. You should use only aged sawdust. Sawdust has no appreciable effect on soil acidity.

The major problem of adding sawdust is the greater likelihood of developing nitrogen deficiency. As sawdust breaks down in the soil, it uses nitrogen, making it unavailable to plants. Therefore, along with sawdust you need to add materials that supply nitrogen to keep plants from starving. Apply the additional nitrogen needed at the time the sawdust is added and repeat as a side dressing during the growing season. For each bushel of dry sawdust, apply about 3 pounds dried blood *or* 1 pound of potassium nitrate *or* 1/2 pound of ammonium nitrate. You can also use other materials at rates determined by the percentage of nitrogen contained. The garden may need later applications also if plant growth is poor due to lack of nitrogen.

Sewage sludge. In some areas sewage sludge may be available as a source of organic matter. Two types may be available: digested sludge and dried, activated sludge.

Digested sludge is relatively low quality as a fertilizer compared to the other type. Apply and plow in digested sludge in the early fall. Do not apply digested sludge directly where you plan to grow a crop the same season, unless it has been composted. It generally contains from 1 to 3 percent nitrogen. Sewage sludge can be a highly variable product. Some sources may contain heavy metal ions and are best not used in the vegetable garden.

Dried, activated sludge is made from sewage that has been separated from coarse solids, inoculated with microorganisms and aerated. It is filtered, dried in kilns, ground and screened. It is useful as a fertilizer on lawns and is heat treated, making it sanitary for garden use. This type of sludge may contain from 5 to 6 percent nitrogen. Apply dried, activated sludge at about 5 to 7 pounds per 100 square feet; apply digested sludge at about 7 to 10 pounds per 100 square feet.

Never apply untreated or raw sewage to garden soil for any purpose.

Organic vs. Inorganic or Man-Made Fertilizers

One of the greatest arguments among gardeners comes in the area of fertilization. Some prefer totally natural materials; others are content with man-made materials; many use a combination of both. In some cases, the selection is based on economics. Often, the availability of organic materials is limited when large quantities are needed.

For plant growth, both forms of fertilizer can be equally effective. Organisms in the soil break down organic materials to form inorganic, water-soluble materials identical to those formed by man. Plants are unable to determine a difference in the original source of the compounds they absorb. Extra growth often is a response to better root environments and action of soil organisms working on the organic matter.

While some materials, such as manure, add organic matter as well as fertility, other organic fertilizers are not suppliers of organic matter. One of the major benefits of organic fertilizers is that they break down slowly and are less likely to release nutrients rapidly enough to burn plant roots if used in large amounts. Many man-made fertilizers are more soluble and can burn if used improperly. Since many organic materials break down slowly, they supply nutrients to plants for a much longer period of time without frequent applications. Because they are not quickly soluble, they are not leached from the soil during heavy rains and, therefore, are more continuously effective. Some organic fertilizers also contain micronutrients.

The availability of nutrients from organic fertilizers depends on their breakdown by soil organisms, which in turn depends on weather and soil conditions. Release of nutrients is much slower when the soil is cool or heavily saturated with water. Also, breakdown slows during drought unless soil is irrigated or heavily mulched to keep in soil moisture and keep temperature more constant. Where you need a quick fertilizer response, inorganic fertilizers tend to provide it. Many of the organics have a fertilization lag. Their nutrients are not available to plants until the organic matter has decomposed.

Sources of Organic Fertilizers

Following are some organic fertilizers that supply nutrients but add little or no organic matter.

Sources of nitrogen (N). *Dried blood* contains about 12 to 14 percent nitrogen, and therefore can be considered a nitrogen fertilizer, although it also contains about 2 percent phosphorus and 0.5 percent potassium. It may appear either red or black, depending on the process used to remove water during drying. Dried blood releases nitrogen relatively fast. General application is about 2 to 4 pounds dried blood per 100 square feet of garden area. It leaves an acid reaction in the soil. Dried blood is sometimes used as a rabbit repellant.

Hoof and horn meal contains 12 to 14 percent nitrogen as processed, dried hoofs and horns. Although once commonly used as a fertilizer, it is now nearly unavailable in most areas.

Tankage is derived from the dried and ground by-products of animal slaughter. While often available as a livestock feed, this same material can be used as a fertilizer. It averages about 6 to 11 percent nitrogen/and may contain about 10 percent phosphorus. Garbage tankage, made from the dried, ground products of household waste, may also be used, although it is not readily available.

Fish meal is the dried, ground, processed material derived from non-edible fish or fish scraps. As a fertilizer it may contain from 8 to 10 percent nitrogen, 4 to 9 percent phosphorus and 2 to 3 percent potassium. As it breaks down, this material gradually becomes available to plants as a fertilizer. Fish fertilizers also benefit plants by the addition of many minor and micronutrients. Fish emulsion is a liquid form often used for houseplants.

Sources of phosphorus (P_2O_5). *Bone products*, one of the earliest sources of phosphorus for fertilizing plants, are available in three forms:

- bone meal (ground bone softened by steam under pressure),
- acidulated bone (ground bone treated with sulfuric acid), and
- ground bone (bones cooked but not steamed).

Bone meal is the form most often used as a plant food. The meal from unsteamed bones may contain 20 to 22 percent phosphorus, while that from steamed bones will contain from 23 to 30 percent P_2O. Rate of use for soils low in phosphorus is about 2 pounds per 100 square feet. Bone meal is commonly used as a source of phosphorus in livestock feeds and is generally available from livestock feed suppliers.

Rock phosphate is made by grinding a natural rock containing one or more calcium phosphate minerals. It is used either directly after grinding or after concentration as a phosphorus fertilizer. Rock phosphate normally contains between 25 and 30 percent phosphorus. Rock phosphate is more effective in acid soils and relatively ineffective on alkaline soils due to its low solubility. It is most useful as an addition in composting manure and organic materials. Soils low in phosphorus may require ground rock phosphate at about 2 to 4 pounds per 100 square feet of garden soil. When applying with manure or compost, use about 2½ pounds per 25 pounds of manure or compost.

Sources of potassium (potash, K_2O). *Wood ashes* may contain from 4 to 10 percent potassium. Generally, they average about 5 percent potassium with as much as 23 percent calcium. Because of this, they produce an

alkaline reaction on the soil. Since they go quickly into solution, you should use them with care. Continued use may raise the pH of the soil, making it too alkaline, unless adjustments are made. Use wood ashes at a rate of about 2½ pounds per 100 square feet of garden area. Do not soak ashes in water before application or the potassium will be lost. Do not apply wood ashes if the soil pH is over 6.5. Apply ashes at least 3 weeks before planting seeds. Coal ashes are not beneficial to plant growth.

Greensand is sometimes recommended as a source of potassium but is not readily available in many areas. It is a hydrated salt of iron and potassium silicate and contains about 6 percent potassium, which is very slowly available to plants.

Seaweed can be the name for any plant that grows in the ocean, but the material used for fertilizer is usually made from brown or red algae. Giant kelp is a seaweed that was harvested for both fertilizer and explosives during World War I. Kelp contains 20 to 25 percent potassium chloride, but the seaweed that is normally available for use as a fertilizer contains from 4 to 13 percent potassium. Although seaweed was once commonly used as a fertilizer, availability is now relatively limited.

Other organic fertilizer sources. A wide variety of other materials may be used as fertilizer. Some have a more balanced range of nutrients in them, although often none of the nutrients are in large amounts.

Cottonseed meal is the residue after the oil is extracted from cooked cotton seeds. It averages 6 percent nitrogen, 2 percent phosphorus and 1 percent potassium, along with secondary and micronutrients. Nutrients from cottonseed meal become available to plants gradually. Cottonseed meal produces an acid reaction in the soil.

Soybean meal, as well as cottonseed meal, is mainly used as an animal feed. However, nonfeed quality meal is sometimes used as a fertilizer. Its nutrients average about 6 percent nitrogen, 1 percent phosphorus and 2 percent potassium. Its reaction in the soil is only slightly acid.

In some localities other plant materials are available that may serve as plant nutrients as well as add organic matter. Some of these include tobacco stems, castor pomace, cocoa shell meal, sunflower meal and mushroom compost.

Sources of Inorganic or Man-made Fertilizers

Those choosing fertilizers from organic sources generally do not use those that are inorganic or those made by man. However, since references and recommendations are often made in terms of inorganic fertilizers, following are a few of the most common along with their major nutrient content, so you can make comparisons.

Sources of nitrogen (N). *Ammonium nitrate* is a common inorganic fertilizer that contains about 33.5 percent nitrogen. It absorbs moisture from the air when humidity is high, and therefore must be stored in tight containers or bags.

Ammonium sulfate, another common constituent of mixed fertilizers, contains about 20 percent nitrogen.

Calcium nitrate, which forms when limestone reacts with nitric acid and is neutralized with ammonia, contains about 15 percent nitrogen. It has been used as a nitrogen source when additional calcium may be needed in the soil.

Sodium nitrate, also called Chile saltpeter, is mined from natural deposits in Chile, but may also be produced synthetically. It contains about 16 percent nitrogen and 26 percent sodium.

Urea is an organic compound synthesized by combining carbon dioxide with ammonia under high temperature and pressure. It contains no less than 45 percent nitrogen (usually about 46 percent), which is rapidly available to plants. Urea is sometimes used for foliar fertilizer applications. Its rapid availability and high nitrogen concentration make careful use important.

A related product, Urea-formaldehyde fertilizer (also called Urea-form) has 35 percent or more nitrogen. A large portion of this nitrogen becomes available to plants gradually. It is much safer to use than urea, and fewer applications are necessary. It is a common nitrogen source used in lawn fertilizers.

Sources of phosphorus (P_2O_5). *Superphosphate* forms when rock phosphate is treated with either sulfuric acid or phosphoric acid. The process of production will determine the amount of phosphorus contained in the finished product and may range from 20 to 50 percent. A common superphosphate analysis is 0-20-0, while treble superphosphate is 0-45-0.

Sources of potassium (K_2O). *Potassium chloride* is also known as muriate of potash. It is made by the action of hydrochloric (muriatic) acid on potassium-containing materials. It contains about 60 percent potassium (potash).

Potassium nitrate is a commonly known as saltpeter or nitrate of potash. Natural deposits occur in some parts of the world and were once mined extensively. However, most saltpeter is now made synthetically. It contains a minimum of 12 percent nitrogen and 44 percent potassium. A common analysis is 13-0-44.

Potassium sulfate is also known as sulfate of potash. It can be made from a number of potassium-containing materials and contains about 48 percent potassium.

Adjusting soil acidity

The acidity of a soil is measured in units called pH. The proper soil pH is important for the breakdown of organic matter and the release of nutrients in the soil for plant growth. A soil pH of 7.0 is neutral, neither

acid or alkaline. A pH above 7 is called a sweet or alkaline soil, while a pH below 7 is known as a sour or acid soil. Most garden plants grow best in soil with a pH range from 6.0 to 6.8. Breakdown of organic matter, nutrient release by microorganisms and availability of most nutrients is greatest in this pH range.

A soil test is the only way to accurately determine the pH of a soil, but plant growth may be an indication of pH problems. When you have apparently applied adequate fertilizer but plant growth is poor, you might suspect improper pH. Ground limestone is normally used to make acid soils less acid, while sulfur is used to make alkaline soils more acid.

Most Missouri soils tend to be acid rather than alkaline, making the addition of ground limestone more common than the addition of sulfur. Since the average garden performs best in a pH range from 6.0 to 6.8, Table 3 suggests sulfur or limestone required to make a midway change close to 6.5. Remember that these amounts are approximations, and soil type and conditions may alter the results. At all times proceed with caution. Ideally, do not apply more than 1 pound of sulfur or 5 pounds of limestone per 100 square feet in one application. If larger amounts are required, split applications between spring and fall to create a gradual increase or decrease. Work the materials thoroughly to a depth of 6 or 7 inches.

Table 3. Sulfur or Limestone Applications To Adjust Soil pH to 6.5.

pH change		*material used*	*Sandy loam*	*Loam soil*	*Clay soil*
			lbs. to apply per 100 sq. ft.		
from	to				
7.5	6.5	sulfur*	1½	2	2½
7.0	6.5	sulfur*	¼	½	¾
6.5	6.5	— — —	0	0	0
6.0	6.5	limestone	3	4	6
5.5	6.5	limestone	5	8	11
5.0	6.5	limestone	7	11	15
4.5	6.5	limestone	10	13	20
4.0	6.5	limestone	12	16	23

*Iron sulfate or aluminum sulfate may be used in place of sulfur but will require about 2½ times more material to make an equivalent pH change.

If you use wood ashes to reduce acidity, use about two-thirds the amount recommended for limestone.

Disease Control Methods

Plant diseases may seriously stunt or even kill plants. They may appear as leaf spots, wilts, stunts, rusts or by a variety of other symptoms. Plant diseases may be caused by fungi, bacteria, viruses, nematodes, or may be a response to environmental conditions that produce disease-like symptoms. The key to good disease control is prevention.

Some, but not all, diseases may require frequent spraying with traditional chemicals to provide adequate control. Use cultural procedures to prevent disease infection with or without spraying to help reduce the seriousness of some diseases.

Genetic resistance. Whenever available, the use of resistant varieties is the best way to prevent disease problems. Response to disease attack may vary, as indicated by the terms immune, resistant and tolerant. Disease immunity indicates that a plant will not get a disease even though the disease is present. Disease resistance implies that although a plant may occasionally contact the disease, it is much less likely to get it, and if attacked, may not be seriously affected. Tolerance to a disease implies that the plant usually contacts the disease when present but is able to survive in spite of being infected.

Resistant varieties are becoming more readily available in many crops. Look for disease resistance in variety descriptions. Disease resistance of vegetable varieties is indicated in the "Vegetable Planting Calendar," Grounds for Gardening Guide 6201.

Crop rotation. Crop rotation is as old as agriculture. Continued cropping in one area allows for buildup of disease organisms. Rotating crops each year to help prevent buildup of organisms in one place can reduce some disease problems. Disease such as clubroot and some vascular wilts may persist in the soil for five or more years without the presence of a susceptible plant. For these and similar problems, very long rotation times are necessary.

Sanitation. Sanitation is important to the control of plant disease. Destruction of weeds or other plants that may serve as overwintering host plants, along with elimination of crop plants that have been diseased, is important. Careful selection of new plants, seeds or cuttings is important to avoid introduction of diseases into the garden or landscape.

Protection. In some cases, careful selection of disease-free seed and propagating material helps disease control by avoiding introduction. Certified seed potatoes are a good example of a case where the use of disease-free seed pieces keeps the soil clean and protects against inoculating the field with soil diseases.

Following are practices that can help control plant diseases:

1. Use disease-resistant varieties whenever they are available, as well as varieties suited to the local growing conditions.
2. Select garden locations with good soil drainage, adequate sunlight, and good soil.
3. Improve the soil with organic matter and fertilizers to develop the best soil tilth for growing seeds and plants.

4. Rotate the garden locations. If the garden space is too limited for garden rotation, rotate crops within the space available.
5. Use disease-free transplants and seeds from reputable suppliers. Do not plant more than you can take care of properly.
6. Eliminate weeds around the garden area that may serve to harbor diseases throughout the year.
7. Control insect pests that serve as disease carriers.
8. Pull up and destroy any plants showing diseases, as those caused by viruses, which can not be controlled. Pull off diseased leaves as soon as you notice them to help slow the spread of leaf spots and other fungus diseases.
9. Spade under or remove and destroy crop residue as soon as harvest is completed if disease was a problem during the season.
10. Do not overcrowd plants. Overcrowding prevents good air movement and exposure to adequate sunlight. High humidity and too much shade caused by these conditions can increase the development of some diseases.

Controlling Insects

At one time gardens had few insect problems. The current movement of people over long distances has helped move pests to areas where they were once unknown or uncommon. Many more problems that need control face the modern gardener.

Many common insect pests can be controlled with modern chemicals. In avoiding their use, however, you must be willing to work a little harder and accept some insect damage in your garden. Following are a few techniques that can help control insect attack and spread. Some of these are the same as those used to control disease:

1. Since you will not be able to avoid all insect damage, plant more of a crop for adequate harvest.
2. Check crops often and hand pick any insects present before they become too numerous.
3. Encourage natural insect predators when possible.
4. Although not common, some plants have insect resistance. Select them when available.
5. Do not plant crops in large blocks. Mixing different types of plants helps slow the spread of insects that are present.
6. The concept of trap crops may also help. These are less desirable crops planted near the garden. The hope is that insects will be attracted to and consume these crops more than the desirable ones.
7. Supplement mechanical controls with biological and natural pesticides. These include dormant oils, lime-sulfur, elemental sulfur, pyrethrins, rotenone and nicotine. Use these materials carefully, according to directions of the manufacturer.
8. Fertilize, cultivate and water to promote vigorous growth. Healthy plants seem less attractive to insects, and those that are attacked are better able to survive and still produce a crop.
9. Rotate the crop. Some insects may overwinter in the soil or other debris. Moving the crop may delay their attack in spring.
10. Use transplants when possible. These develop more quickly than seeds in the garden. The quicker you can grow and harvest the crop, the less chance of insect pests seriously damaging the plants.
11. Destroy any garden debris or nearby weeds that may serve as breeding or overwintering places for insects.
12. Fall cultivate the garden. This buries deeply or exposes some insects and insect eggs to birds or for dessication during winter freezing and thawing.
13. Keep the garden free of weeds that may harbor pests.

Biological control of insect pests. The biological control of insect pests refers to the use of disease organisms, predacious or parasitic insects, insect-feeding birds, toads, and other animals.

When these are used, a certain amount of damage must also be expected, as these predators are not always present at the time the insects are numerous, and their increase in numbers usually follows an increase in the pests. Releasing pests (such as ladybugs) and predators has been successful in some areas. One of the most successful biological controls has been the use of a bacteria, *bacillus thuriengensis*, for control of cabbage loopers and cabbage worms in cole crops.

Remember than when any kind of insect predator is released in the garden, the pests must already be present to serve for food. If insects are not present, the predators will move elsewhere looking for food.

Soap as an insecticide. Some people suggest that soap is effective as an insecticide. This recommendation dates back to the 1700's. Modern soaps vary widely, and their effectiveness as an insecticide also varies and is sometimes questionable. It seems that the most effective soap for an insecticide is the old-fashioned homemade soap prepared from waste lard, tallow, lye and water. If there is any benefit from these materials, remember that it comes from some of the more caustic soaps, not detergents.

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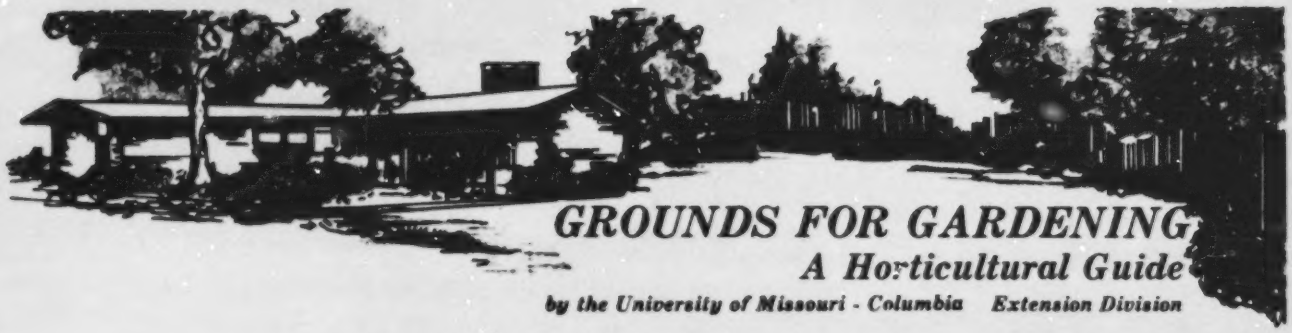

GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri - Columbia Extension Division

Growing Home Garden Tomatoes

R. R. Rothenberger and A. E. Gaus,
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Tomatoes are a popular home garden crop. They require a small area, bear repeatedly, are widely adapted and easy to grow, and have many culinary uses. Tomatoes are rich in Vitamin C and low in calories.

VARIETIES

Consider productivity, fruit characteristics, and disease resistance in selecting a variety. Select varieties resistant to fusarium wilt because this disease is a problem in all parts of Missouri.

The following tomato varieties have been developed for Missouri conditions.

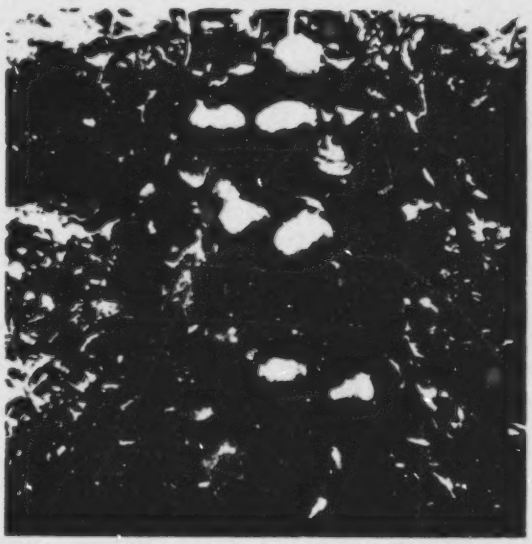
Avalanche is a fusarium wilt resistant hybrid that was introduced in 1963. The medium-large, red, globe-shaped fruit is very crack resistant. Avalanche doesn't develop green shoulders. It is very productive and matures in 70 days.

Beefmaster was introduced in 1971. It is a hybrid that is fusarium wilt and nematode resistant. Fruit is very large, red 'beefsteak' type. It has good late season production and matures in 80 days.

Better Boy is a fusarium wilt and nematode resistant hybrid that was introduced in 1970. It has medium to large red fruit. Better Boy is very productive and matures in 75 days.

Patio was introduced in 1965 and is fusarium wilt resistant. Upright, 24-inch plants produce medium size red, smooth fruit. It can be grown in large pots or patio tubs and matures in 70 days.

Pink Delight is a fusarium wilt resistant hybrid that was introduced in 1975. The fruit is medium-large, smooth, pink and globe shaped. Pink Delight is crack and split resistant and productive. It matures in 70 days.



Well-grown tomatoes produce an abundance of delicious fruit.

Pink Savor was introduced in 1973 and is fusarium wilt resistant. Pink, plum-shaped, one ounce fruit is grown for salads. This variety is vigorous, productive and crack resistant. It matures in 75 days.

Redheart is a fusarium wilt resistant hybrid that was introduced in 1970. Fruit is large, smooth, meaty and red. Tomato center has a deep red "heart." This variety matures in 75 days.

Show-Me was introduced in 1977. It is a fusarium wilt resistant hybrid. The medium-large, dark red fruit is blocky and very firm. It is resistant to cracking and matures in 72 days.

Sunray was introduced in 1950 and is fusarium wilt resistant. Orange-yellow fruit has good size and flavor. It matures in 80 days.

Sun-Up was introduced in 1963. This hybrid is early bearing and fusarium wilt resistant. The compact, bush-type plant does not need to be staked. It has a concentrated early set, but it requires fertile soil. Fruit is red, with good crack resistance and uniform ripening. It matures in 62 days.

Supreme is a fusarium wilt resistant hybrid that was introduced in 1957. Fruit is medium-large, smooth, globe shaped and red. It has average crack resistance and some green shoulder. This is a good all-around tomato that matures in 70 days.

Surprise is a hybrid that was introduced in 1955. It is fusarium wilt resistant. Fruit is medium-large, smooth, slightly flattened globe shaped and red. It is crack resistant, firm and productive. It matures in 65 days.

PRODUCING TOMATO PLANTS

Earliness of production and quantity of fruit produced may be influenced by quality of the plant at the time it is set in the garden.

The ideal tomato plant should be 8 to 10 inches tall, dark green, with a stock stem and well developed root system. Normally, six to eight weeks are required to produce this type of plant from seeds.

A family interested in having only fresh fruit should plant three to five plants per person. If enough fruit is wanted for processing, then five to ten plants per person should be planted.

To get best results with only a few plants, and to minimize trouble, purchase them from your local plant grower at the proper planting time.

If a fairly large quantity of plants is needed, they may be started from seeds in a good seeding mix that has been sterilized. After seed has germinated, plant seedlings at least 2 inches apart for stocky development, and give them plently of light.

If kept in the house, expose them to a south window, and rotate them regularly to give uniform light. Daily temperatures should be kept below 80 degrees F. but not lower than 45 degrees F.

Make a soil mix from one part coarse sand; one part well rotted manure, leaf mold, or peatmoss; and two parts loam soil. If the soil is a heavy clay, increase the quantity of organic matter to two parts.

Plants may be grown well in hot beds where they can be kept sufficiently warm. Then shift them to cold frames late in the season. Use peat pots for easy transplanting.

SELECTING GROWING AREA

Tomatoes grow best when they receive full sunshine. Plant them away from trees and buildings to get highest yield. A tomato plant needs a lot of water, so arrange for easy watering. Select a well drained area because poor soil aeration leads to root loss and physiological problems such as blossom-end rot.

PREPARING SOIL FOR PLANTING

Tomato plants grow well in many types of soil. Work the soil only when it is dry enough so it will not stick to tools. Improve garden soil by adding peat moss, leaf mold, well rotted manure, or other organic materials. Add lime and fertilizers when the soil is prepared. Take a soil test if fertilizer needs are not known.

Tomatoes grow best in nearly neutral soil with pH of 6.5 to 7.0. You seldom need to add more than one pound of agricultural limestone to an area of 100 square feet. Apply lime in late fall or early spring.

FERTILIZING

Add a complete garden fertilizer at the time soil is prepared. For tomatoes, use a fertilizer low in nitrogen (N), high in phosphorous (P), and medium to high in potassium (K). Among the best analyses for tomatoes are 8-32-16 and 6-24-24.

Use a maintenance rate of 2 pounds per 100 square feet after the proper fertility level has been developed from previous soil tests and fertilizations. If only 5-10-5, 5-10-10, or similar analyses are available, apply 3 pounds per 100 square feet.

All fertilizer should be well worked into the upper six inches of soil. Additional details of soil preparation and fertilization are in University of Missouri Extension Division Folder 48, "Good Garden Soil."

SETTING OUT PLANTS

Set tomatoes in the garden when the weather has warmed, and soil temperatures are above 60 degrees F. Tomato growth is impaired by temperatures below 50 degrees.

In south Missouri plant tomatoes outside from April 20 to May 15. In central Missouri May 5 to 20 is the approximate planting time, and in north Missouri and the Ozark area, planting from May 10 to 20 is usually best.

Before planting, remove all clay pots, plastic pots, or wood bands from the soil ball. Peat pots should remain. Set plants a little deeper than they were originally growing so lower leaves are next to the ground. If only "leggy" plants are available, plant them at about a 30 degree angle in a trench long enough to leave only the top five or six inches of the plant exposed. Roots will develop along the buried portion of the stem. If the plant is in a peat pot, make sure the entire pot is covered. Exposed portions of the pot will act as a wick, and rapidly dry the root ball.

Apply one cup of a fertilizer solution around the roots after placing the plant in the hole. Use a completely soluble fertilizer such as a 10-52-17 at the rate of 2 level tablespoons per gallon of water. Guard the plant base from cutworms with a wax paper collar about three inches high (two inches above the ground and one inch below).

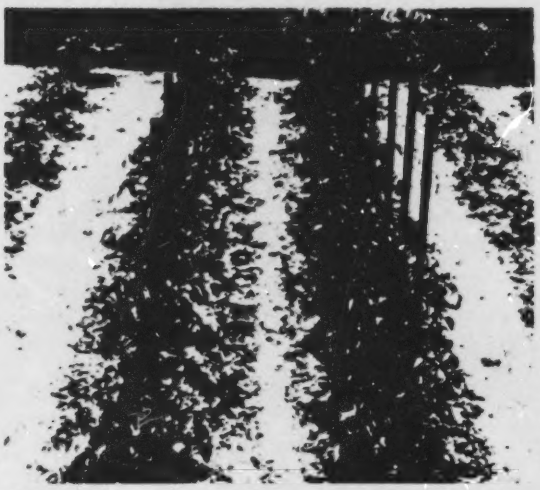
PLANTING DISTANCES

Distances between plants depend on the type of tomatoes and whether plants will be staked, or grown on the ground. Space dwarf plants 12 inches apart, and staked tomatoes should be 12 to 18 inches apart if grown single stem. Plants pruned to more than one stem should have 2 feet between plants. It is impractical to train a bush or dwarf tomato on a stake because pruning reduces production. Allow 2 to 4 feet between non-staked plants.

Rows should be spaced three to five feet apart, however those for non-staked plants should be four to six feet apart. Plant patio type tomatoes in containers 10 to 12 inches across with sufficient depth to allow good root development.

STAKING

Staking allows more plants in a given area, and the fruit is easier to harvest, larger, cleaner, and free of ground rots. Staked plants also lend themselves to better insect



Proper spacing and staking are essential for healthy plants and good fruit production.

and disease control. Stakes can be made from a 1 x 2 inch piece of wood 6 feet long, pointed at one end. Place it firmly about 4 inches from the plant, at time of transplanting. Use soft cord for tying plants to the stake, and allow at least ½ inch of slack for stem enlargement.

PRUNING

Remove side shoots or suckers when they are 3 to 4 inches long. Don't cut suckers with a knife because this practice may spread diseases that may be present. Details of pruning are available in UMC Guide No. 6460, "Pruning and Training Tomatoes."

WATERING

Give tomatoes at least 1 inch of water per week during May and June, and 2 inches a week during July, August, and September. Keep a record of rainfall and supply the extra needed.

Soak the soil thoroughly when watering. Frequent light waterings will encourage a weak root system. Plants growing in small containers need daily waterings.

SIDEDRESSING

Fertilizer applied at time of planting will not supply enough nutrients for the entire season. Too much nitrogen in the beginning brings heavy vegetative growth, and poor fruit set.

Apply the first side dressing when the first fruits are about one-third grown. Apply 1 pound ammonium nitrate per 100 foot row, or approximately one tablespoon per plant. Mix the fertilizer carefully into the soil. Don't get fertilizer on the foliage.

Apply the second side dressing two weeks after picking the first ripe fruit, and make a third application one month later. Water in the nitrogen if rain is not likely.

CULTIVATING AND CONTROLLING WEEDS

Many weeds are carriers of diseases that may seriously affect tomato plants when transmitted by insects or man. Weeds also compete for soil moisture and nutrients.

Use mulches to avoid a lot of hoeing and hand weeding. Mulches also reduce moisture evaporation from the soil. Hay, straw, ground corncobs, peatmoss, grass clippings, or black polyethlene sheeting can be used. Apply organic materials 2 to 4 inches thick to prevent weeds from developing.

Herbicides may be beneficial in fairly large plantings of tomatoes. For suggested types and procedures see UMC Guide 6951, "Garden and Home Grounds Weed Control."

HARVESTING

Tomato color and flavor are best when daily average temperatures are about 75 degrees. High temperatures soften the fruit, and the good red color does not develop. At temperatures below 60 degrees normal ripening process is altered and decay may be increased.

Mature green fruits can be harvested in the fall and held for later use. Select fruits free of disease, wrap them in paper, and store them at about 60 degrees F. They will ripen slowly and provide good tomatoes for several weeks. Store fully ripened tomatoes in the refrigerator.

PHYSIOLOGICAL PROBLEMS

Many of these disorders are quite common, and should be readily recognized. Little can be done for most of them, but the fruit may be eaten if affected portions are removed. These problems are not caused by insects or disease.

Flower drop—especially noticeable on early flowers when the grower is anxious for fruit to set for an early harvest. The problem occurs when night temperatures are lower than 55 degrees F., or when day temperatures are higher than 95 degrees F. Hot drying winds may intensify the problem.

Varieties also will differ in their temperature response. Fruit-setting hormones may be used to help set fruit early in the season when the weather is cool. The problem usually disappears and fruits set normally after the weather improves.

Leaf roll—older and lower leaves of some tomato varieties may roll and become stiff and leathery. It is not a disease, and is most common on plants that are trained and pruned. Fruiting is not affected by this condition.

Blossom-end rot—very common problem on home grown tomatoes. It appears as a depressed brownish, rather dry rot the size of a dime to a half dollar on the blossom end of the fruit. It is caused by a combination of calcium deficiency coupled with wide fluctuations in available moisture. Training and pruning may increase blossom-end rot. Remove the affected fruit so others on the plant will develop normally, and keep the plants well watered. Provide good soil drainage.

Sunscald, poor color—high temperatures retard the development of good color, and fruits exposed directly to the hot sun may scald. Sunscald is localized damage to the tissue often accompanied by discoloration. Good foliage cover is helpful.

Cracking—fruit cracking varies with the variety. The problem is often intensified by training and pruning. Variation in soil moisture may also increase cracking as fruit is enlarging. Select varieties that are crack resistant.

Catfacing—badly formed tomatoes and the blossom end is rough with scar tissue. Cold weather at time of blossom set intensifies the deformities. Catfacing is usually most common in the large-fruited "Beefsteak" type tomatoes.

Cloudy spots—irregular whitish spots just under the skin. This is the result of stink bugs feeding on the fruit at some stage in its development.

CHEMICAL PROBLEMS

Chemical injury—drift from 2,4-D and similar chemicals commonly used on lawns and in fields may cause distorted leaves, twisted stems, dropping of flowers, and fruit abnormalities. The drift may originate one-half mile or more away. Sprayers that have been used for herbicide, and then used for disease and insect control on tomatoes may also be a source of contamination.

Walnut toxicity—plants growing under black walnut trees may wilt and die. Avoid growing tomatoes within 50 feet of these trees.

INSECTS

There are a variety of insects that may attack tomatoes, although they can be controlled with a regular spray schedule. Control methods are given in UMC Guide 6206, "Controlling Insect Pests in Home Gardens."

The following insects are a few that commonly attack tomatoes.

Cutworms—fat, gray, brown or black worms up to 1¼ inches long. They cut off plants close to the soil surface. They are most destructive early in the season. Use a wax paper collar described above in "Setting Out Plants."

Flea Beetles—black or brown jumping bugs 1/16 inch long attack young transplants and leave them looking as though they have been shot full of small holes.

Hornworms—large green worms up to 4 inches long eat foliage and fruit. Hand-pick them if only a few, however sprays can be used for large infestations.

Leaf miners--larvae that make long, slender white tunnels in the leaves. Start sprays early.

Stalk borer—larvae are creamy-white to light purple and eat tunnels in the stem, causing the plant to wither and die. Remove and destroy weeds where the insect may breed. Locate hole in stem where the borer entered. Split stem lengthwise above the hole and kill the borer. Bind the split stem and keep the plant well watered. Spray to prevent further infestations.

Stink bugs—brown, green, or black shield-shaped bugs that give off a foul odor. They suck juices from the plant and cause hard, whitish spots just under the skin of the fruit. Sprays are effective.

Tomato fruitworm—green, brown or pink worm that eats holes in fruit and buds. Sprays during June will help control this insect. Make several applications.

Spider mites—this tiny, tannish mite, barely visible to the naked eye, causes many small yellow specks and fine webs. Sprays must be used for control.

DISEASES

Tomatoes are attacked by Early Blight, Fusarium wilt, Anthracnose, Septoria leaf spot, tobacco mosaic virus, curly top virus and Verticillium wilt. For description and control of these diseases see UMC Guide 6202, "Vegetable Disease Prevention in Home Gardens."

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GROUNDS FOR GARDENING
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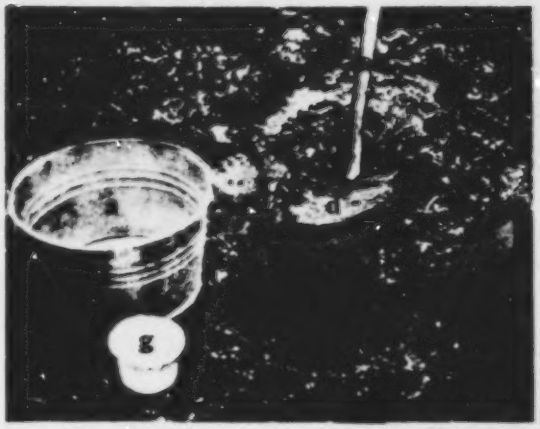
Steps In Fertilizing Garden Soil

(Vegetables and Annual Flowers)

Art Gaus, Vic Lambeth, and Ray Rothenberger
Department of Horticulture, College of Agriculture



Good garden soil provides both a chemical and physical environment for root development.

STEP 1—HAVE SOIL TESTED

You can't *look* at the soil, or *smell* it, or *feel* it and tell whether it has 30 pounds or 300 pounds of available phosphate. But if you bring a sample of this soil to your University Extension Center, it can be tested to tell you how much available phosphorus is in it.

Why is it so important to know how much phospherus is in your soil? Simply because vegetables and flowers grow poorly where soils contain less than 300 pounds per acre.

Your soil test report also tells you the level of potassium, calcium (lime), and magnesium in your garden, and indicates the pH of the soil. This is about all you have to know to properly fertilize your garden soil.

To make it easy for you to interpret the soil test results, your report form will indicate *how much of what kinds* of fertilizer you should apply in carrying out Step 2.

How do you take a soil sample?

a. Take a spade and clean pail.
b. Push spade deep into soil.
c. Throw out a spade full of soil.
d. Cut a half-inch to an inch slice of soil from the back of the hole with the spade. Be sure the slice goes 7 inches deep and is fairly even in width and thickness. Place this sample slice in bucket.
e. Repeat five and six times at different spots over your garden.
f. Thoroughly mix the six or seven slices you have in the bucket.
g. After thoroughly mixing, take out about one pint of soil and mail it or, preferably, take it to your University Extension Center.

How long will it take to get the results?

Usually from one to two weeks, depending upon the number of samples coming in to the soil testing lab.

When should the sample be taken?

Any time of the year—*but*, if you can take your sample during October, November or December you will likely get faster service than in the rush season, January through March.

How often should your soil be tested?

Once every four or five years is sufficient if you follow Steps 3, 4, 5, and 6.

Is there a charge for this soil test?

Yes, a nominal fee to cover costs of chemicals and a technician.

STEP 2—ESTABLISH BASIC FERTILITY LEVEL

This just means putting fertilizer--the *right kind* and *right amount*—on your garden. Your soil test report will indicate the kind and amount to apply.

Remember that this basic application is a fertility building process and will not be needed every year. After this level is established, it can be maintained by following Steps 3, 4, and 5.

The best method for making the *basic application* is to put on half the recommended fertilizer and plow or spade deeply, then apply the other half and disc or rake in lightly. This distributes the fertilizer throughout the upper 7 inches.

Important! Your soil test report may recommend *"no basic application."* This means the fertility level of your garden is all right. If the report shows you have too much of an element, leave it out of fertilizer applications. Plowing just a little deeper for a year or two and sowing green manure crops will also help reduce the effects of the element that is in excess.

STEP 3—APPLY MAINTENANCE FERTILIZER

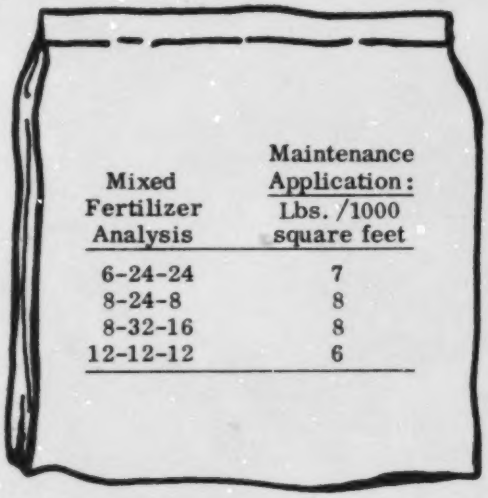
You can skip this step *if* you are establishing the basic level this year. But each year thereafter it is important that you apply *maintenance fertilizer*. It is usually applied in the spring before the soil is worked into a seedbed. It need not be worked deeply into the soil—the upper 3 to 5 inches will do. The purpose of this maintenance application is to *replace* the fertility you have taken off in the form of vegetables, flowers and crop residue the preceding year.

Again the question comes up: "How much of what kind of fertilizer should I use?" A mixed fertilizer is used for this maintenance application. A mixed fertilizer contains three elements: Nitrogen (N), phosphorus (P_2O_5), and potassium (K_2O).

When you see a fertilizer bag with a combination of numbers such as 8-24-8, 12-12-12 or 6-24-24, you are dealing with mixed fertilizers. The first number tells how many pounds of nitrogen are in 100 pounds of the fertilizer. The middle number always refers to the pounds of phosphorus, and the last to the pounds of potassium per 100 pounds of the fertilizer.

Thus, for example, for every 100 pounds of an 8-24-8 fertilizer you buy, you get 8 pounds of nitrogen, 24 pounds of phosphorus, and 8 pounds of potassium.

Four of the mixed fertilizers most commonly sold in Missouri are listed below on the sketch of a fertilizer bag. Check your bag of fertilizer and find the corresponding analysis in the table. The second column indicates the amount to use per 1000 square feet of garden area. If the analysis on your bag is different from those listed, choose the analysis that is nearest to it and use the rate indicated.



Mixed Fertilizer Analysis	Maintenance Application: Lbs. /1000 square feet
6-24-24	7
8-24-8	8
8-32-16	8
12-12-12	6

STEP 4—USE STARTER FERTILIZER

As defined here, a starter fertilizer is *a water soluble fertilizer used in the transplant water*.

Phosphorus is the most important element needed in getting your transplants off to a good start. Therefore select a water soluble fertilizer that has a high phosphorus content in relation to the nitrogen and potash.

The following are the best and most commonly available water soluble fertilizers: 10-52-17, 8-32-16, 12-24-12, 15-30-15, and 13-26-13. Use any of the above at the rate of two *level* tablespoons

per gallon of water. Apply *one cup* of this solution around the roots of your plant after you place it in the hole.

STEP 5—SIDEDRESS WITH NITROGEN

Vegetables and flowers vary in the amounts of nitrogen they need. Usually, vegetable crops require *most* of their nitrogen *after they have made considerable growth or begun to fruit.* Too much nitrogen before this time will delay maturity and reduce flowering and yields.

The major portion of the nitrogen your plants use comes from three sources: (1) The breakdown of organic matter, (2) the yearly maintenance application of fertilizer, and (3) the nitrogen sidedressings.

Until the plant starts fruiting or makes considerable growth, the first two sources of nitrogen supply enough. But afterward, the demand of the plant for nitrogen often exceeds that supplied by the first two, and a nitrogen sidedressing is needed. Because vegetable crops vary so greatly in both amounts and times of application of nitrogen sidedressings, the chart below was developed for handy reference. Annual flowers do not vary as much, and a single treatment may be made for the entire planting.

RECOMMENDED NITROGEN SIDE DRESSINGS

Crop	Pounds per 100 ft. row* Ammonium Nitrate** 33-0-0	Time of Application (Sprinkle the nitrogen fertilizer in the row middles and water in if rain not likely)
Vegetables		
Tomato	1	1) one to two weeks before first tomato ripens; 2) two weeks after picking first ripe tomato; 3) one month later.
Cucumber, Cantaloupe	1	1) one week after blossoming begins; 2) three weeks later.
Sweet Corn	1	1) When plants are 8-10 inches tall; 2) one week after tassels appear.
Asparagus	2	Before growth begins in spring.
Potato	1 1/2	After tuber formation starts.
Peas & Beans	1	After heavy bloom and set of pods.
Peppers, Eggplants	1	After first fruit sets.
Cabbage, Cauliflower, Broccoli	1	Three weeks after field transplanting.
Spinach, Kale, Mustard & Turnip greens	1	When plants about one-third grown.
Onions (mature)	1	One to two weeks after bulb formation starts.
Sweet potatoes, Watermelons, Carrots, Beets, Turnips Parsnips, Lettuce	None	Excessive amounts of nitrogen will reduce yields or lower quality or both. Sidedressings of nitrogen not needed.
Annual Flowers	1	Four to six weeks after planting.

*A pint of ammonium nitrate weighs approximately one pound.

**Other forms of nitrogen such as urea and ammonium sulfate may be used on an equivalent nitrogen basis

STEP 6—MAINTAIN ORGANIC MATTER

So far we have been primarily concerned with the *chemical* apects of garden soils. Just as important are the *physical properties.* Two major things contribute to physical properties of your soil, *type of soil,* whether sandy or clay, and *organic matter.* You can't alter soil type much but you can control organic matter.

Sandy soils and most soils in the southern part of the state should contain 2 to 3 percent organic matter and clay type soils and soils in the northern part, 4 to 5 percent. Annual applications of organic matter are required to reach these levels and maintain them.

Kind to use and way to apply.

For farm gardens, use animal manures and green manures; for town gardens, use peatmoss compost and animal manures.

Peatmoss makes an excellent source of organic material for the small garden. Coarse types will provide the best soil conditioning.

To make a compost pile, gather all waste material, such as grass clippings, leaves, and plant refuse, and place in layers 6 to 8 inches deep. The pile can be as long as desired but should not be over 5 feet wide and 5 feet high. Add a little soil and a handful of fertilizer to each layer as you build it up. Keep the pile moist. It will be ready in 6 months to a year.

Animal manures are excellent. They should be well-rotted, applied in the *fall*, and plowed under. Weed seeds are the chief objection to animal manures.

Peatmoss, compost, or animal manure should be applied to the soil surface to a depth of about 2 inches, then worked in thoroughly.

Green manures are legumes or small grain crops that are plowed under *while still in the green stage*. Winter green manure crops include rye, wheat, barley, and winter vetch. Summer green manure crops include sudan grass, soybeans, and cowpeas.

An excellent way to handle the organic matter problem on farms is to plant half of the garden to a winter green manure crop in September or early October; then put some well-rotted animal manure on the other half, fall plow it and plant spring vegetables in this part. The following spring, turn under the green manure crop and plant your summer vegetables. Rotate these areas each year. After turning under a green manure crop, *always wait 3 weeks before planting.*

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Leonard C. Douglas, Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211 ■ An equal opportunity institution.

GROUNDS FOR GARDENING
A Horticultural Guide
by the University of Missouri - Columbia Extension Division

Starting Plants from Seeds

R. R. Rothenberger
Department of Horticulture, College of Agriculture

Plants of many annual flowers and vegetables may be started from seeds indoors. Vigorous plants started indoors flower sooner and produce an earlier harvest. Some, however, are best sown directly outdoors when weather conditions permit and are actually delayed by transplanting.

Growing plants from seeds can be a rewarding hobby and also allows home gardeners to grow varieties that may not be available from local plant growers.

Time for Seeding Indoors

The proper time for sowing seeds depends upon when plants may normally be moved outdoors. This period may range from four to ten weeks, depending on the speed with which seedlings grow, and the cultural conditions in the home.

Selecting Seeds for Planting

Purity and trueness to type —Good seeds should not contain seed of other crops or weeds and should be the correct variety. For best results buy quality seed from a reliable dealer.

Packages and storage—Seeds sold in packages should show crop, variety, germination percentage, and chemical seed treatments, if any. Seeds should be kept dry and cool to insure good germination at planting. Laminated foil packets insure dry storage. Paper packets are best kept in tightly closed cans or jars until seeds are planted.

Hybrid seeds —Many new vegetable and flower seeds are hybrids. Hybrid seed often costs more than seed of non-hybrid varieties. However, hybrids usually have increased vigor, better uniformity, better production and sometimes specific disease resistance or other unique cultural characteristics. Each gardener must decide whether the added benefit justifies the added cost. It often does.

Containers for Sowing Seeds

Containers for starting seeds should be clean, sturdy, and fit into the space available for growing plants in the home. The proper container helps get seedlings off to a good start and may save work in later stages of development.

Wood flats, fiber trays, plastic trays —Plants that are easy to transplant may be seeded directly in flats or trays for later transplanting into individual pots or wider spacing in flats. Starting seeds in such containers saves space as compared to seeding directly into individual pots. However, when time is more important than space, direct seeding in pots may be preferred.

Clay and plastic pots —Both types can be cleaned and reused, and provide excellent growth for transplants. They must be removed from the soil ball carefully at planting time. Seeds may also be planted directly into them.

Peat pots —These popular pots are made from peat or paper waste fibers and may be purchased individually or in strips or blocks. They are porous and provide excellent drainage and air movement. The entire pot can be planted, so there is minimum root disturbance at planting time.

Compressed peat pellets —Expandable peat pellets when dry are about the size of a silver dollar, but somewhat thicker. When placed in water they swell to form a cylindrical container filled with peat moss, ready for seeding or transplanting. They may be planted directly into the garden. Use the pellets in trays so that they are easily watered and held upright.

Soil Mixes and Other Growing Media

The medium used for starting seed should be loose, well drained and fine-textured. Prepared mixes are available commercially, or materials can be mixed at home.

Vermiculite —This material when used alone provides good seed germination. It is clean, and if not contaminated during handling, will not need sterilization. If other seeding mixes are used, it is useful for covering seeds since it does not form a crust and provides easy emergence for the seedlings. Vermiculite is available in several size grades. For seeding, a fine grade is best.

Synthetic mixtures —Mixes that contain no soil are available for growing seeds. These contain either a combination of peat moss and vermiculite or peat moss and perlite. They may be purchased ready-made or can be mixed at home. To prepare such a mix use four quarts of vermiculite, four quarts of peat moss, one tablespoon of superphosphate, and two tablespoons of pulverized limestone. These mixes as well as vermiculite used alone have little fertility. Seedlings must be watered with a diluted fertilizer solution soon after they emerge.

Soil-vermiculite mix—Seeds may be started in a mixture of about ⅓ good garden soil and ⅔ vermiculite. Since good soil contains some fertility, prompt fertilization after germination is not so essential. When garden soil is used, the mix must be sterilized before seeds are planted in it.

Soil-peat-sand-mix—Large seeds or vigorous-growing seeds may be planted in a mix of two parts good garden soil, one part shredded peat moss, and two parts either perlite, vermiculite, or sharp sand. Soil sterilization is necessary.

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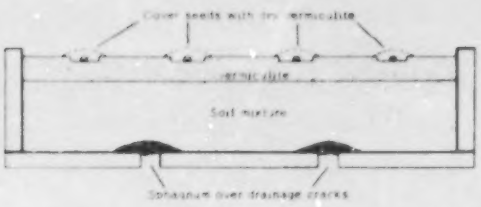

Figure 1

Milled sphagnum moss — This is a ground sphagnum moss sometimes used for starting seeds since it appears to have an ability to inhibit the seedling disease "damping off." It should be well moistened before use. Since it contains no fertility, prompt fertilization is essential after seeds have germinated.

Layered mixes — Another technique used for germinating seeds is to partially fill a flat or pot with a sterilized soil mix, and then top it with a layer of vermiculite or milled sphagnum moss in which the seeds are planted. After germination, roots of seedlings move from this top area into the soil mix which provides fertility, so adding liquid fertilizer is less critical. Fig. 1 illustrates this technique.

Sterilizing Mixes and Containers

To guard against plant diseases carried in soil and on containers, cleanliness and sterilization of materials is important. Place the moist, but not wet, soil mix in a container which can be covered to keep the soil from drying rapidly. If a cover is not available, cover with aluminum foil, and seal down at the edges. The mixes may be sterilized directly in the pots or flats in which they are to be used. In addition to killing disease organisms, many weed seeds are also killed by sterilization.

Pinch a small hole in the center of the foil, and insert the bulb end of a meat or candy thermometer into the soil so that the bulb is about at the center of the soil mass. Place the pan in an oven at 200 to 250 degrees F. Keep the soil in the oven till the thermometer shows a temperature of 160 to 180 degrees. Remove the pan and allow it to cool. Baking soil will give off a strong odor, so some ventilation may be desirable.

The length of time necessary for sterilization depends on the volume of soil, as well as its moisture content. Dry soil can not be sterilized well.

After the soil has been sterilized, make sure that containers, tools and working area are also clean and sterile. Clean soil can be easily reinfected by careless techniques. *In sterile soil reintroduced disease may spread faster than it would in unsterilized soil.*

Sterilizing containers—Wash thoroughly in soapy water all used containers to remove all debris. Don't put wooden flats or plastic containers in the oven. Clean wood and plastic items by rinsing them in a solution of one part chlorine bleach and 10 parts water. Let them dry before filling with soil.

Steps to Seeding

1.) Fill the container up to ½ inch from the top with the mixture to be used. It should be moistened before filling if the mixture is dry. Make sure the container has adequate drainage. Before filling, cover holes or cracks in the container with sphagnum moss or broken crockery.

2.) Level, and gently firm the planting medium. A clean small board may be used for leveling and firming.

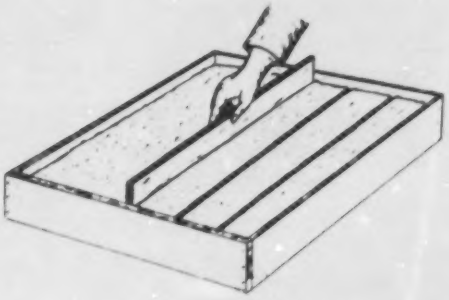

Figure 2

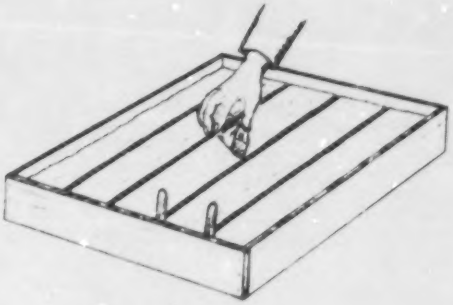

Figure 3

3.) Using a narrow board or large wooden label, make shallow rows about 1 to 2 inches apart in the flat (Fig. 2). When different seeds are used in the same container, they are easier to keep track of if planted in rows. If only one type of seed is used, it may be scattered or "broadcast" over the surface.

4.) Sow the seeds uniformly and thinly in the rows. Many small round seeds may be slowly dropped in the rows by tapping the package as it is held over the rows (Fig. 3). Label each row promptly with plant type, variety, and date of planting.

Large seeded vegetables such as cucumber, cantaloupe, and watermelon should be planted directly into peat pots. Other seeds may also be handled this way to save transplanting, but sowing is difficult with very small seeds. Some small seeds are now available in "pelletized form" to make handling easier. Plant two seeds per pot and later thin to one plant. This saves later transplanting and means less root damage at planting time.

5.) Cover the seeds with dry vermiculite or milled sphagnum moss. The depth of covering depends on the size of the seeds. Very fine seeds such as petunia or begonia need not be covered. Moisten the surface with a fine mist, or place the container in a pan of warm water to absorb it from the base. Don't place in water that is deep enough to run over the top of the pot or flat. It may mix seeds or cover them too deeply. As a general rule, seeds other than the very fine seeds should be covered about two times their diameter.

TABLE 1. GUIDE TO SOWING VEGETABLE SEEDS IN THE HOME

Vegetables	Time for seeding*	Comments
Cool Season Crops		
Broccoli, Cabbage, Cauliflower, Head Lettuce	Late February	Grow cool, tolerate light frost outdoors after hardening.
Warm Season Crops		
Tomato, Eggplant, Pepper	Late March	Keep warm. Do not subject to frost.
Vine Crops		
Cucumber, Cantaloupe, Squash, Watermelon	Late April	Sow directly in peat pots. Keep warm at all times.

*Approximate time for seeding is listed for mid-Missouri (Zone 6). In the Bootheel area (Zone 7) sow about 2 weeks earlier. In North Missouri (Zone 5) sow about 1 week later.

TABLE 2. GUIDE TO SOWING COMMON ANNUAL FLOWER SEEDS IN THE HOME

Time of seeding	Plant Types	Germination Time (Days)	Growth Rate	Cold and Frost Tolerance after Hardening
Early to mid-January	Begonia	10-12	slow	none
	Pansy	6-10	medium	good
	Viola	6-10	medium	good
Early February	Lobelia	15-20	slow	none
	Stocks	10-14	medium	good
Mid February	Black-eyed Susan vine	10-12	slow-medium	none
	Impatiens	15-18	medium	none
	Torenia	10-15	medium	medium
Late February	Petunia	8-12	slow-medium	slight
Early March	Ageratum	5-9	medium	none
	Scabiosa	8-12	medium	slight
	Snapdragon	7-12	medium	medium
	Verbena	12-20	medium	slight
Mid March	Bells of Ireland	21 -	medium	medium
	Dianthus	5-7	medium	medium
	Salpiglossis (Painted tongue)	8-10	medium	none
	Vinca (Periwinkle)	10-15	medium	none
	Scarlet Sage (Salvia)	12-15	medium	none
	Statice	15-20	medium	slight
Late March	Nicotiana	10-15	medium-fast	slight
	Nierembergia	10-15	medium	slight
	Phlox, Annual	6-10	medium-fast	none
	Sweet Alyssum	4-8	fast	slight
Early April	Aster	8-10	medium	slight
	Balsam	6-8	medium-fast	none
	Celosia (Cockscomb)	6-10	fast	none
	Cornflower	6-10	fast	good
	Marigold	5-7	fast	none
	Portulaca	6-10	fast	none
Mid April	Cosmos	5	fast	none
	Zinnia	5-7	fast	none

6.) Slip the flats or containers into clear plastic bags. Since they retain moisture no additional watering should be necessary until after seeds have germinated.

7.) Place seeds in a warm location for germination. Generally a range from 65 to 75 degrees F. is best. A few plants such as larkspur, snapdragon, sweet pea, cabbage, broccoli, and cauliflower are best started at about 55 degrees. Don't place covered containers in direct sunlight.

8.) Watch daily for germination. Containers should be moved to bright light, and the plastic bags removed as soon as germination is well under way. If not all seeds germinate at the same time, cut strips of plastic or cloth, and keep ungerminated rows covered until seedlings appear. Seeds are quickly killed if allowed to dry during germination. Watch closely for development of any disease, and control promptly.

After germination, those plants listed as preferring cool temperatures should be placed in a cool location.

"Damping-off"

When seedlings fall over at the ground line, they are being attacked by a fungus disease known as "damping-off." If only a few seedlings are attacked, dig out and discard the infected plants and soil. Drench the entire soil mass with a fungicide if the disease is scattered throughout the flat or pot. This may not provide complete control. High temperature, poor light, or excess moisture stimulate spread of the disease by weakening plants to make them more susceptible to it. Best control is cleanliness and prompt action when the disease appears.

Growing Seedlings

After seeds have germinated, they must be promptly given the best possible growing conditions to insure stocky vigorous plants for outdoor planting. Cultural requirements must be considered carefully.

Light — Seedlings must receive bright light promptly after germination. Place them in a bright, south window if possible. If a large, bright window is not available, place the flats under fluorescent lights. A fixture containing two 40-watt fluorescent tubes is adequate. Place the seedlings about 6 inches from the tubes, and keep lights on for 14 to 16 hours each day. As seedlings grow, the lights may need to be raised, to prevent leaf burn as seedlings touch the tubes.

Plants need some red and infrared radiation. Since this is not supplied by common fluorescent tubes, additional light from incandescent lamps or windows is necessary. If this can not be given, use a fluorescent tube specially designed for plant growing. These are available under a variety of trade names.

Temperature — Most annual plants and vegetables prefer night temperatures between 60 and 65 degrees. Day temperatures may run about 10 degrees higher. If temperatures are warmer than this, leggy plants result. Cool season vegetable crops and a few flowers already listed prefer night temperatures no higher than 55 degrees and day temperatures near 65. An unused bedroom, basement, or sunporch is often a good location.

Moisture — Good humidity is an asset for producing good plants. A humidifier may be used, or shallow pans of gravel filled with water may be placed as close to the growing area as possible. Flats should be kept moist at all times but never soggy. Allow drying between waterings, but don't allow seedlings to wilt at any time.

Fertilization —Seedlings will need some fertilization for best development. Those in totally artificial mixes need prompt and regular fertilization. Use a soluble house plant fertilizer as sold in garden centers, nurseries, or on plant supply counters. Young, tender seedlings are easily damaged by too much fertilizer. Apply fertilizer at about half recommended strength a few days after seedlings have germinated. After that, fertilize at two-week intervals with the dilution recommended by the manufacturer. Water and fertilize carefully.

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Transplanting

As soon as seedlings have developed at least one set of true leaves and are large enough to handle, they should be transplanted to individual pots or spaced out in flats. Failure to transplant promptly results in crowded, spindly seedlings that may not be able to develop properly. If a hotbed is available, seedlings may be transferred directly to it. Artificial mixes may be used or a soil mix of one part soil, one part peat and one part sand works well for transplants.

To transplant, carefully dig up the small plants with a knife, spatula, or wooden label. Let the group of seedlings fall apart, and pick out individual plants. Occasionally if seedlings have been too close, they are difficult to separate. Gently ease them apart in small groups which will make it easier to separate individual plants. Avoid tearing roots in the process. Handle small seedlings by their leaves; small thin stems break easily.

Poke a hole in the soil into which the seedling will be planted. Make it deep enough so the seedling can be put at the same depth it was growing in the seed flat. Small plants or slow growers may be placed one inch apart. Rapid growing, large seedlings should be planted about 2 inches apart. After planting, firm the soil and water gently. If seeds were sown in individual peat pots or pellets, thin them to one seedling at this time.

Keep newly transplanted seedlings in the shade for a few days, or place them under fluorescent lights. Keep them away from heat sources. Continue watering and fertilizing as was done in the seed flats.

Vegetables easily transplanted include broccoli, cabbage, brussels sprouts, lettuce, and tomato. Those with a little slower root development include cauliflower, celery, eggplant, onion, and pepper. They may be successfully transplanted, however. Plants that do not transplant well, and therefore are seeded in individual pots include cucumber, muskmelon, squash, and watermelon.

Most flowers normally grown indoors transplant well, but a few that are difficult to transplant include poppy, larkspur, lupine, sweet pea, cornflower. These are generally seeded outdoors, but to start them indoors place them directly into individual pots.

Moving Plants Outdoors

Hardening

Plants which have been growing indoors can't be planted abruptly into the garden without injury. To prevent any damage, they should be "hardened" before planting outdoors.

This process should be begun at least two weeks before planting in the garden. If possible, plants should be moved to cooler temperatures outdoors in a shady location. A coldframe is excellent for this purpose. When first put outdoors, keep in the shade, but gradually move plants into sunlight for short periods each day. Gradually increase the length of exposure. Don't put tender seedlings outdoors on windy days or when temperatures are below 45 degrees. Reduce the frequency of watering to slow growth but don't allow plants to wilt. Even cold hardy plants such as cabbage and pansy will be hurt if exposed to freezing temperatures before they have been hardened. After proper hardening, however, they can be planted outdoors, and light frosts will not damage them.

Planting into the garden

When plants have grown large enough to handle easily, and hardening is complete, they may be planted into the garden if weather conditions permit.

Carefully remove plants from the growing flats, leaving as much soil mix as possible around the roots. Dig the hole about twice as large as the soil mass around the roots. Set the plants at about the same level they have been growing in the pots. A few plants such as tomato and marigold are able to develop roots along the stem. If they have become leggy, they may be planted deeper than they were previously growing. Place soil loosely around the roots, and apply about one cup of a starter solution. This solution is made by dissolving one tablespoon of high-phosphorus fertilizer in one gallon of water. A 10-52-17 or similar analysis is satisfactory.

Plants grown in clay and plastic pots must be removed from them before planting. Those grown in peat pots or peat pellets can be planted intact. Breaking the base of the peat pot often helps improve root penetration and drainage. Make sure the top edges of the pot are thoroughly covered. If not covered it may act as a wick, and evaporate moisture around the root ball. This delays root penetration or even causes the plant to dry up on hot sunny days.

Transplant on cloudy days if possible. In warm, sunny weather cover the newly planted seedlings with newspaper tents, or some other type of shading for two or three days until they are well established. Keep plants watered as necessary.

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Leonard C. Douglas, Director, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.

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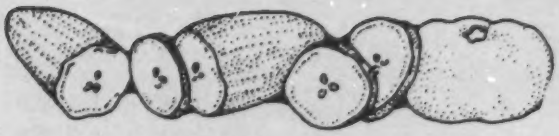
FOOD GROUPS	CHILD SIZE SERVINGS PER DAY	
	Age 1 - 3 years	Age 4 - 6 years
MEAT AND MEAT SUBSTITUTE	2 Servings	2 Servings
Beef, Pork, Liver, Fish, Poultry	½ to 1 oz.	½ to 1½ oz.
Eggs	1	1
Dry Beans	2 - 4 Tablespoons	3 - 4 Tablespoons
Peanut Butter	2 Tablespoons	2 - 4 Tablespoons
MILK AND MILK PRODUCTS	2 - 3 Servings	2 - 3 Servings
Milk, Whole, 2%	1 Cup (8 oz.)	1 Cup (8 oz.)
Instead of 8 oz. of milk:		
Cottage Cheese	2 Cups	2 Cups
Cheese	1 oz.	1 oz.
Yogurt	½ - 3/4 Cup	3/4 Cup
Pudding	1 Cup	1 Cup
Ice Cream	1 3/4 Cups	1 3/4 Cups
BREAD AND CEREALS (Whole grain or enriched)	4 Servings	4 Servings
Bread	½ - 1 Slice	1 - 1½ Slices
Crackers	3 - 4	5 - 6
Ready to eat Cereals	1/3 - ½ Cup	½ - 3/4 Cup
Cooked Cereals	1/3 Cup	½ Cup
Plain Macaroni, Spaghetti, Noodles, or Rice	1/3 Cup	½ Cup
FRUITS AND VEGETABLES	4 or More Total Servings	4 or More Total Servings
Vitamin C Sources (citrus juices and fruits, tomato, berries, cabbage, green pepper, broccoli, cantaloupe, spinach, brussel sprouts, sweet potatoes, asparagus)	½ Cup of Juice or 2 - 3 Tablespoons equals 1 serving (1-2 servings per day)	½ Cup of Juice or 4 Tablespoons (¼ Cup) equals 1 serving (1-2 servings per day)
Vitamin A Source (broccoli, greens, spinach, apricots, cantaloupe, carrots, pumpkin, winter squash, sweet potatoes)	2 - 3 Tablespoons equals 1 serving (2 servings per week)	4 Tablespoons (¼ Cup) equals 1 serving (2 servings per week)
Other Fruits or Vegetables (including potatoes, apples, bananas, etc.)	2 - 3 Tablespoons equals 1 serving (2 or more servings per day)	4 Tablespoons (¼ Cup) equals 1 serving (2 or more servings per day)

THE CHILDREN'S MERCY HOSPITAL - 24th and Gilham Road



APPENDIX

Pages 76-78 consists of a letter to the parents introducing the nutrition program along with a questionnaire of the child's daily food habits. You may also inquire if the parents would be interested in participating in the lessons with the children at school.

Pages 79-81 are letters to reinforce the lessons and to communicate to the parents the activity of the lesson.

EXAMPLE OF INTRODUCTORY LETTER TO PARENTS

Dear Parents:

Nutrition Education is an important part of your child's education. We are interested in discovering what children's food likes and dislikes are and if we can provide them with new information about nutrition that will help them lead healthy lives.

In order for us to develop our program to benefit your child, we would appreciate your taking time to fill out our nutrition questionnaire and return it to school as soon as possible. Your cooperation is appreciated. We hope to be able to talk with all of the parents concerning our program throughout the school year.

NUTRITION QUESTIONNAIRE

Child's Name_____ Age_____

Do you consider your child a good eater? YES____ NO____

Does your child eat a variety of vegetables? YES____ NO____

Does your child eat a variety of fruits? YES____ NO____

How many servings of fruits and vegetables does your child eat every day?_____

Is mealtime a pleasant time in your home? YES____ NO____

Please check the column which most accurately describes how your child likes the following fruits and vegetables.

VEGETABLES	LIKES A LOT	LIKES SOMETIMES	DOESN'T LIKE	HASN'T TRIED
Beets				
Broccoli				
Brussel Sprouts				
Cabbage				
Carrots, cooked				
Carrots, raw				
Cauliflower				
Celery				
Corn				
Greens				
Squash, Zucchini				
Squash, yellow				
Spinach				
Green Beans				
Lettuce				
Mixed Vegetables				
Sweet Potatoes				
White Potatoes				
Green Pepper				
Radish				
Tomatoes				
Lima Beans				

FRUITS	LIKES A LOT	LIKES SOMETIMES	DOESN'T LIKE	HASN'T TRIED
Apple				
Applesauce				
Banana				
Cantaloupe				
Cherries				
Fruit Cocktail				
Grapes				
Grapefruit				
Orange				
Peach, fresh				
Peach, canned				
Pear, fresh				
Pear, canned				
Pineapple				
Plums				
Raisins				
Strawberries				
Watermelon				

Do you have any comments concerning your child's eating habits?

_____

_____

_____

_____

Do you believe a child's health can be affected by what he eats?
YES____ NO____

EXAMPLE OF HOME LETTER

Dear Parents:

Today we made a tossed salad with lettuce, spinach, carrots, tomato, celery and green pepper. We used bean sprouts and sunflower seeds for special ingredients. We tossed the salad and tasted it with salad dressing. We learned to be clean and be careful when we prepare foods. Can your child tell you how it tasted?

EXAMPLE OF HOME LETTER

Dear Parents:

Today we made Orange Julius. It is made with milk and orange juice. We would like you to have this recipe!

Does your child know where milk comes from?

ORANGE JULIUS

1 can concentrated orange juice
1 can of milk
crushed ice

Blend orange juice, milk and crushed ice together in blender.
OPTIONAL: Add package of vanilla instant breakfast to milk and orange juice.

EXAMPLE OF A HOME LETTER

Dear Parents:

For our last class session we had a food tasting party. Can your child tell you all the things we tasted today? Yogurt tastes different than milk but it has the same good things for our bodies in it. Which fruit did your child like the best with yogurt?

The following is an evaluation letter to be sent at the end of your program. The letter was designed to see how effective the parents thought the program was and whether they were able to use any of the information at home to change food dislikes or likes. It also gives parents a change to express their views about the program.

Dear Parents:

It has been such fun working with your children! They are so eager to participate in our food activities. Of course, our hope is that the children will be more willing to try new foods at home. In order for us to see if our program is making any changes in your child's food dislikes or likes, we would appreciate your filling out this brief questionnaire and returning it to school as soon as possible. Again we appreciate your help.

Does your child tell you about what the puppet did in class with him/her? YES____ NO____

Do you use the class experience at the table as something to talk about? YES____ NO____

Does your child seem more willing to try new foods? YES____ NO____

Does your child seem more willing to taste foods he does not like? YES____ NO____

Does your child seem to want to help you cook? YES____ NO____

Can your child recognize and name the following foods? (Please circle the ones your child recognizes).

Broccoli	Bean Sprouts	Orange	Green Pepper
Carrots	Celery	Apples	Tomato
Spinach	Cauliflower	Banana	Grapefruit

Did he recognize these foods before? YES____ NO____

Does your child enjoy the classes? YES____ NO____

Does your child know that good foods help him stay healthy? YES____ NO____

Other comments:

Thank you for your prompt response.

Sincerely,

The following evaluation forms are examples of the types that may be used by you to evaluate class presentations in order to make alterations for future presentations.

TEACHER EVALUATION OF NUTRITION EDUCATION PROGRAM Lesson #_____

Subject:

Date:

Classroom:

YOUR OBSERVATIONS:

Was the activity too long? too short?

Was the activity appropriate for the children and presented on their level of understanding?

Did the children talk about the activity once it was over?

YOUR SUGGESTIONS:

Any suggestions for improving the presentation or making it more enjoyable for the children?

Was the group size appropriate?

PRESENTER EVALUATION

EVALUATION: LESSON #_____

Subject:

Actual length of class:

ACTUAL ACTIVITY:

List the difference between what was planned and exactly what happened.

OBSERVATIONS:

SUGGESTIONS FOR CHANGES:

What could have been done more effectively?

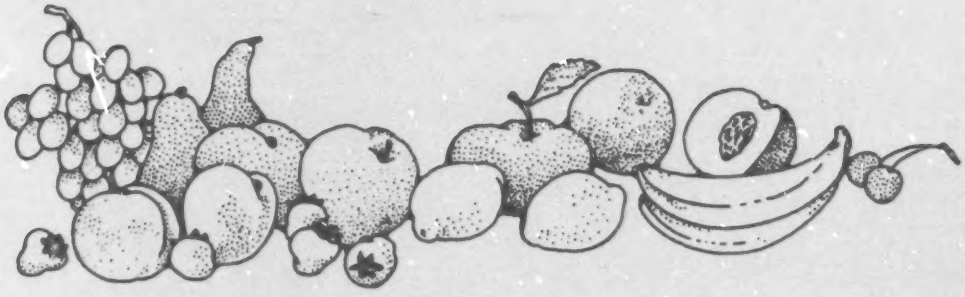
How did the children respond to each activity?

The faces were not mentioned in the lesson plans but could be a valuable tool in working with handicapped children who cannot speak and or hear.

There are three choices:

1. One without either good or bad connotations
2. One with good connotations
3. One with bad connotations

Developed by Donna Towers, M.S., R.D. Permission granted to allow these pictures to be copied.



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RECORDS

"All Aboard! Train to the Zoo/Farm/Ranch"

"Build Me A House"/"Silly Will"/"Milk's Journey"

"Carrot Seed"/"Eagle and the Thrush"/"Wait 'Till the Moon is Full"

OTHER RESOURCES

1. National Dairy Council - Food models, milk information (films), "Food Early Choices." 6300 North River Road, Rosemont, Illinois.

2. Milton Bradley Company, Springfield, Mass. - Vegetables and Fruits poster cards (pictures of the tree and plant as well as the single fruit or vegetable).

3. Music Resource Book, Lutheran Church Press,
Songs for Early Childhood, Westminister Press,
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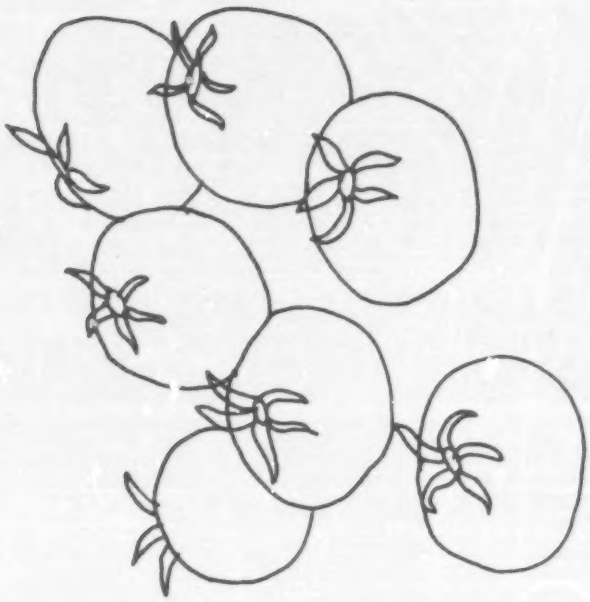
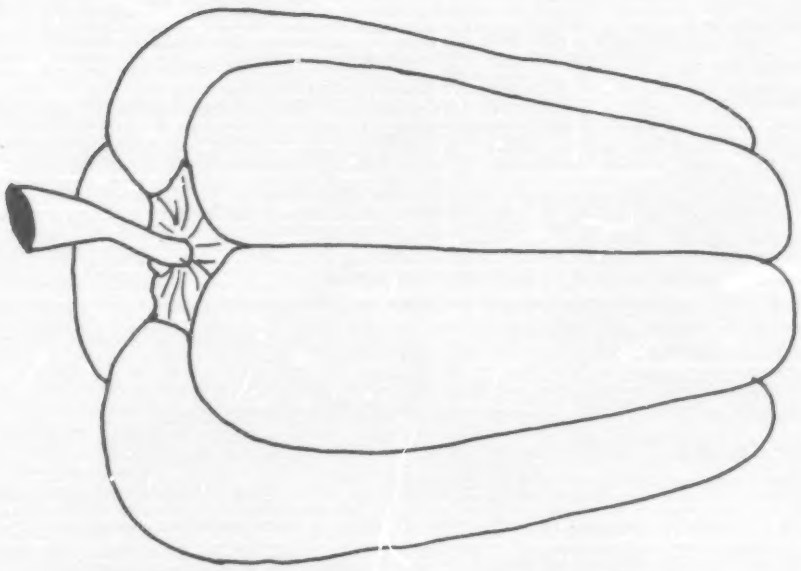
4. University of Missouri Extension Service, Columbia, Missouri 65211.





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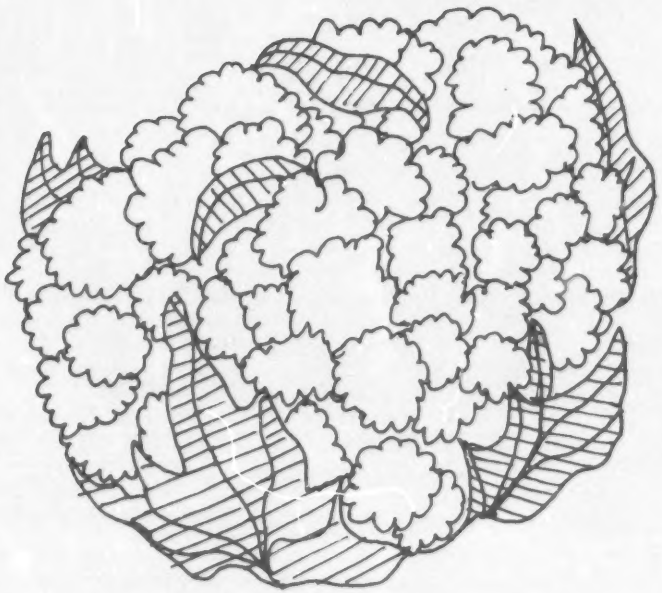

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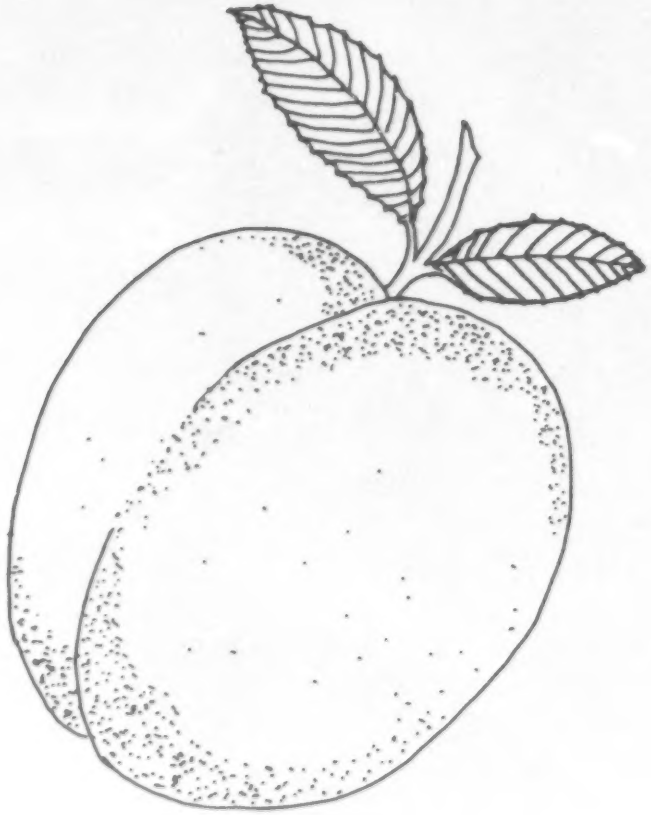

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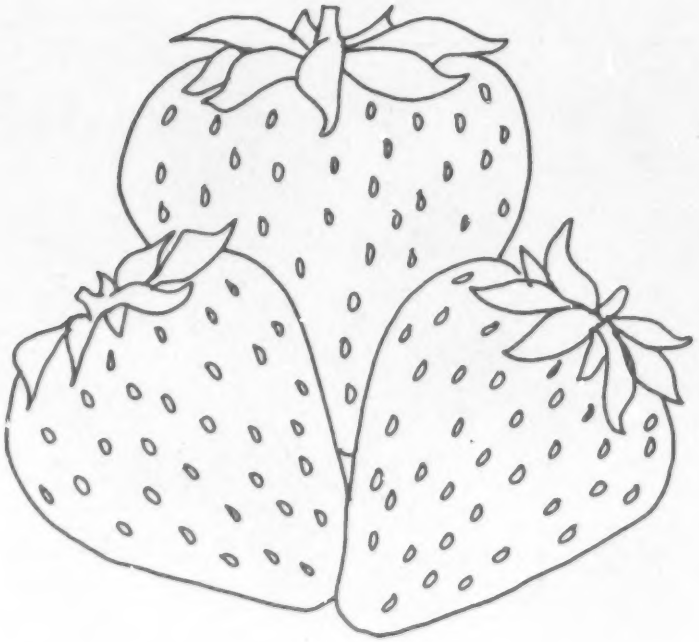

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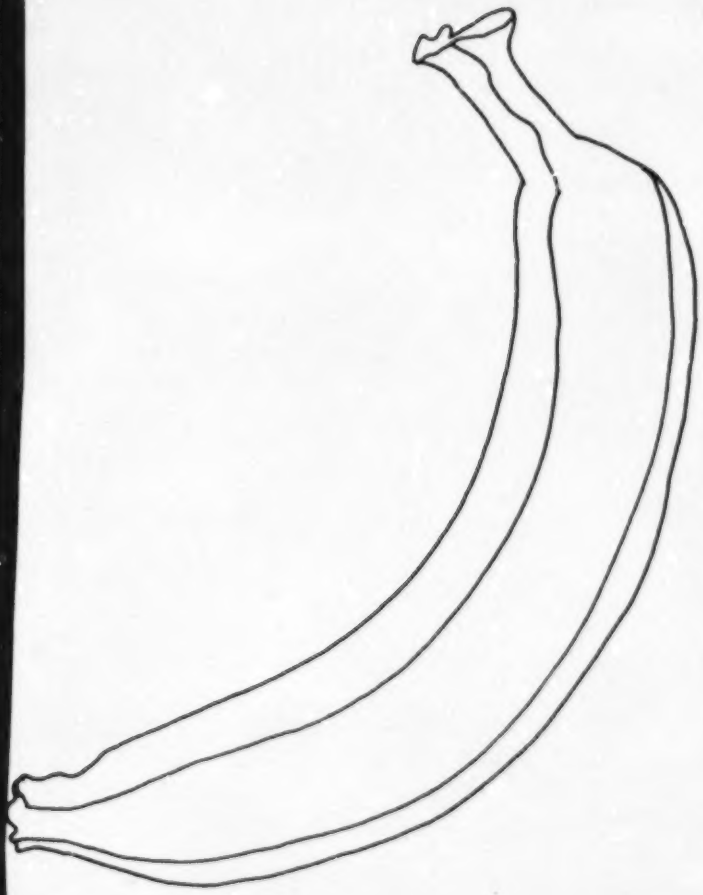

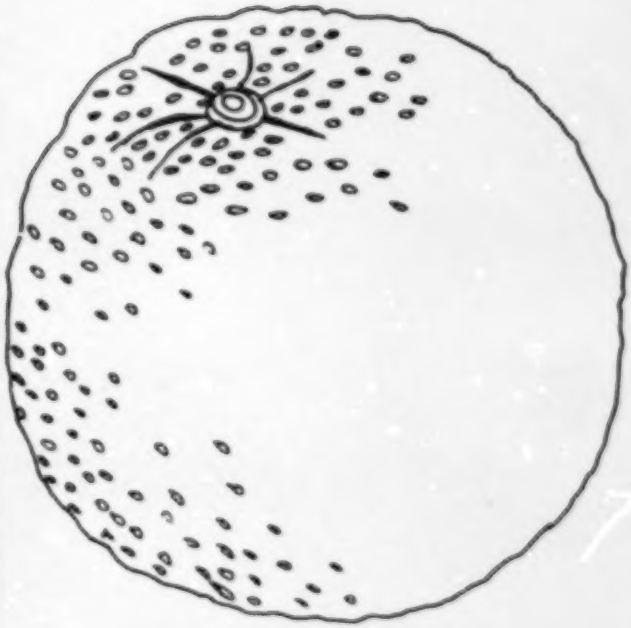

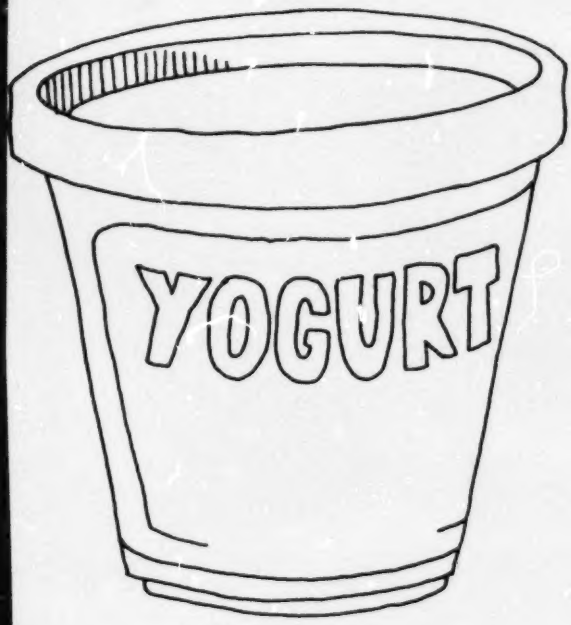
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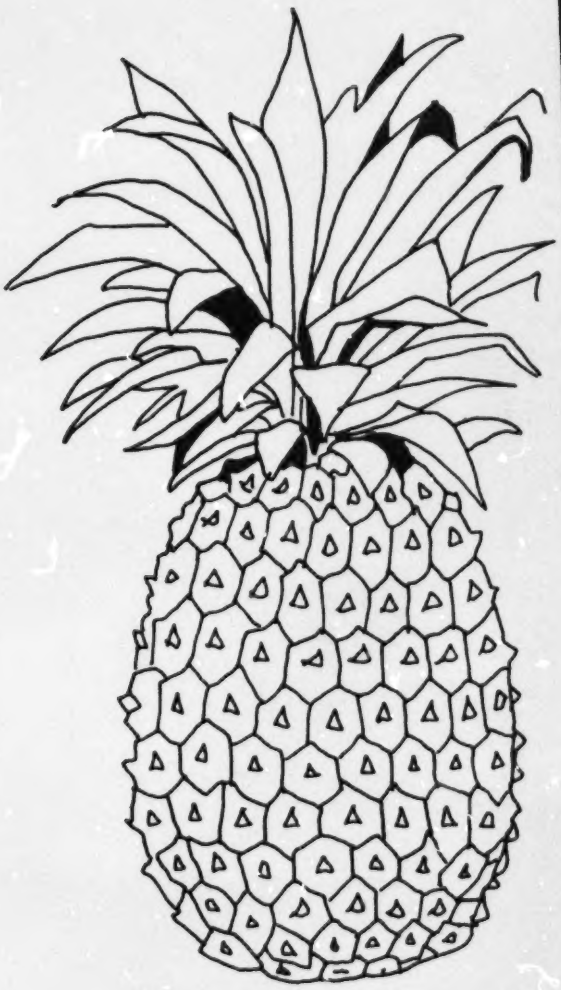

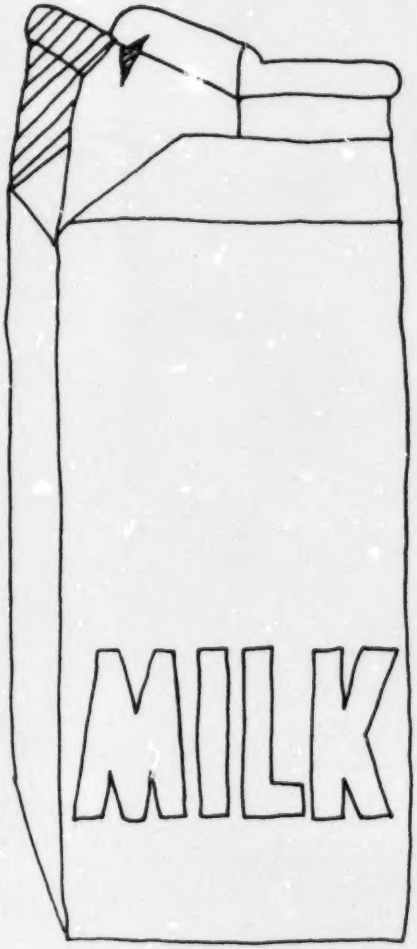
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